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Specialists

The Problem of "Technological Unemployment"

WITH its rapid development and very wide scope, the electrical industry has experienced many changes in its works processes and methods and, also, in the circumstances of its manufacturing concerns, whose development or decline is influenced by the improvement or superseding of their products. These continually changing tides have been responsible for casting up many good men on the stony shores of unemployment—specialists who have devoted their energies over a number of years to a definite line of work. Through no fault of their own such men, hitherto regarded as indispensable, find that their store of experience is no longer required and they have no immediate prospect of obtaining alternative employment.

Vital changes may come about almost in a night—even the alteration of an import duty may dictate their future, and conditions at the end of the war are unlikely to make the question less acute. In normal times there may be no outlet immediately available for their specific knowledge. Then starts the scrambling in hard competition for any suitable, or even unsuitable, openings. As time continues and their attempts to place themselves meet with no success, their services are offered for less and less remuneration and the margin of the bank balance shows the danger light, for there is no dole for this comparatively well-to-do class. As technical men grow in age, experience and value to the industry, so their difficulties increase.

In some instances, employers are able and willing to maintain the specialist until he can adapt himself to another branch of their activities or they may, in view of past services, grant him a leaving gratuity in order to maintain him during his search for a new post. On the other hand, they may consider that their responsibilities cease entirely when they decide to discontinue his engagement.

If the specialist has previously received a high rate of remuneration he may have accumulated sufficient capital to support him for the time being or he may be so blessed with friends and financial means as to enable him to start manufacturing in competition with his former employers. Such conditions are, however, exceptional. More often his remuneration has been too meagre to allow of his having saved more than sufficient to tide over a short period. Also, the technical specialist often has little aptitude for commercial matters. When his savings are exhausted he may appeal to the benevolence of his technical societies, but this ought not to be required for the aid of fit and able men.

By attaining positions of importance in any particular sphere such men have proved their ability to assimilate and use their knowledge. If given opportunities in other directions, they could soon apply themselves equally well to these to the advantage of the industry. Certainly, they do not want charity, and the industry should not allow such talent to be wasted or under-employed.

A suggestion has reached us that if all such technical men earning more than, say, £500 per annum would now combine in a society, contributing definite monthly amounts while in employment, with similar assistance from the manufacturers, there would be an assurance, by self-help, of financial support in the event of loss of position. Employers also would benefit by the reduction of wastage of valuable men and, if financially interested, would endeavour to make available suitable alternative employment.

Compulsion in Ulster

FOR some time past the Government of Northern Ireland has been endeavouring without success to obtain the agreement of the Belfast Corporation to a scheme of co-ordination of the Belfast, Londonderry and Larne electricity undertakings under some form of Government control. The Corporation's principal fear seemed to be that it would lose the annual contribution which the Electricity Department has made to the city rate fund for some years; it has averaged £17,600 during the past decade. Now the Minister of Commerce has abandoned persuasion and resorted to compulsion. A controller has been appointed to take complete charge of the undertaking. While there are reasons for regretting that this step has been taken we do not think the loss of rate relief is one.

Lightning

ALTHOUGH the chief bane of overhead transmission, particularly in its effects on expensive terminal apparatus, lightning storms are too few in this country to provide the data required to minimise the trouble they bring. References appeared in annual reports of the Central Electricity Board a few years ago to investigations being carried out by the Electrical Research Association on its behalf in Nigeria, where thunderstorms are many times more frequent. The results are given in the paper by Messrs. F. R. Perry, G. H. Webster and P. W. Baguley which was discussed by the I.E.E. Transmission Section last week. This should be regarded only as an interim report, however, since still more information is required about lightning characteristics, bearing in mind the complexities of power transmission networks.

The Central Register

HARD things have been said about the Central Register and no doubt some criticisms have been deserved, for all human institutions fall into error occasionally. But many of the alleged shortcomings are not to be blamed on to the Register; they have been due to a misapprehension of its functions. It has provided a pool upon which the Service Departments and industry could call when they wanted technical men. The initiative lay with them; the Register could not undertake to find jobs for all who had sent their names in. The whole system is now to be reorganised and the Central and Supplementary Registers will be merged in a new department of the Ministry of Labour which will endeavour to find positions for those who need them.

Order in Variety

IT can hardly be said that full advantage was taken of the opportunity provided by the I.E.E. Installations Section to members interested in colliery electrification to express their views as to how far standardisation should be carried and the best means for giving effect to the consensus of opinion on the subject. Yet some form of co-operative rationalisation seems to be needed, since the position in the mines is more difficult than in other industries. No doubt the material provided in Mr. J. A. B. Horsley's paper, together with the criticisms of those who did contribute to the discussion, will be most useful to the Post-War Planning Committee, but it would have been more helpful if any objectors had made themselves heard, even if they thereby ran the risk of conversion by argument.

Bus-Zone Protection

AN article on fires in switch houses in this issue gives some particulars of bus-zone protection systems. These were originally regarded with suspicion as likely to cause inadvertent tripping of circuit-breakers, and the report of the Fire Risks Committee of the Electricity Commissioners published in 1938, suggested that for the time being they should be employed for fault indication only. Subsequent experience, it has been officially stated, has shown bus-zone protection to be sufficiently reliable for application to direct tripping under fault conditions and to have prevented major damage in several cases.

Electric Soldering

Survey of Methods

By
S. F. Philpott,
A.M.I.E.E.

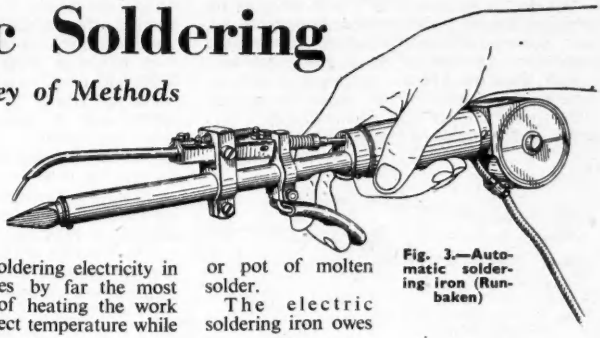


Fig. 3.—Automatic soldering iron (Runbaken)

FOR the purpose of soldering electricity in most cases provides by far the most convenient means of heating the work and maintaining the correct temperature while the joint is being made.

It is used in four ways:—(1) The soldering iron having a copper bit heated by a self-contained element; (2) A stove for heating plain copper soldering bits where the use of these is considered desirable instead of a self-contained electric bit.

The application of electricity to the process of soldering—which is said to date from Roman times—has resulted in considerable improvement both in quality of work turned out and in the speed of doing it

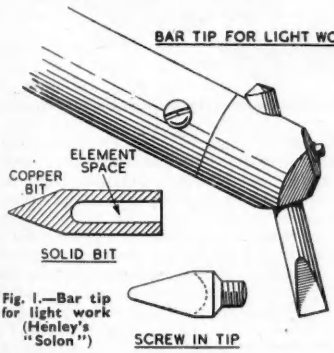


Fig. 1.—Bar tip for light work (Henley's "Solon")

(3) For direct heating of the work, eliminating the use of an iron, the solder being applied directly to the heated joint (the newest development). (4) As the heating medium in pot soldering where the article is dipped into a tank or pot of molten solder.

The electric soldering iron owes its superiority over the plain bit to its convenience. It enables heat, at the correct temperature, to be applied where it is required and work can go on indefinitely without the need for reheating. There is less risk of over-heating and burning the copper, and the electrically heated bit remains cleaner in working than do those employing gas, oil, or other externally applied heating medium. It does not cause that vitiation of the atmosphere which is apparent when gas or oil heating stoves are used.

Correct temperature is essential for reliability and speed of soldering—the most suitable temperature of the bit depends on the composition of the solder being used and on the size and class of the work. The latter also determines to a great extent the size of bit necessary for a given job. A small iron may have insufficient heat capacity to maintain adequate working temperature when the object is large or is of high heat conductivity (*e.g.*, copper articles) or is of such a form that it acts as a radiator of heat.

In addition to this, the ideal electric soldering iron should not overheat in those periods when it is not in actual use but is left in circuit. This condition is not readily met, and the larger the iron the more difficult does the problem become.

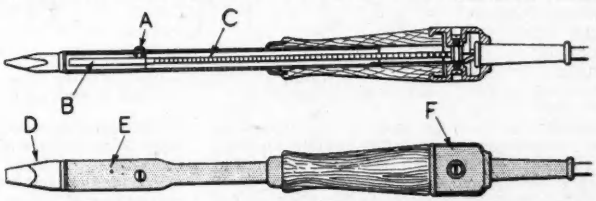


Fig. 2.—Section of "Solon" iron. A, fixing screw; B, steel-cased element; C, bead insulation over nickel-chrome leads; D, oval tapered bit; E, rust-proofed steel case; F, bakelite connection box. Length 7 in. overall

All electric soldering irons have a copper tip which is heated by an element within the bit, and to secure efficient operation, *i.e.*, with the maximum amount of heat going to melt solder, there must be the minimum of obstruction to the transfer of heat from the element wire to the copper tip. Generally the tip is solid and completely surrounds the element,

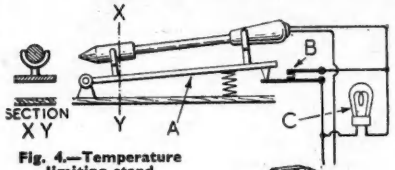


Fig. 4.—Temperature limiting stand

but in some makes the tips are screwed on, while for light work a separate bar tip is often used (fig. 1).

A chisel shaped bit is most generally used because of its large sectional area and consequent good heat capacity, but for work in confined situations and light work generally a pyramid shaped bit is more convenient. The copper bit (illustrated in fig. 2) has a corrosion-proof finish, and completely encloses the element which is contained in a steel casing. The bead-covered leads from the element, are carried through the stem of the iron to the terminal block in the handle, thus eliminating any joints in the heated portion of the iron which may cause corrosion and failure. A rubber cord grip moulded to the cable is provided. The consumption of the irons illustrated in figs. 1 and 2 ranges from 65 to 240 W according to size, and each model takes about four minutes to heat up.

An improvement on the ordinary soldering bit is the automatic type shown in fig. 3. At the rear of the iron is a reel of flux - covered solder which can be fed forward as required to the working surface of the bit by operation of the finger trigger. The advantage of this arrangement is that iron, solder and flux can all be operated with one hand, leaving the other free for manipulation of the work.

The electric soldering irons described are for hand operation. Irons are also made for mounting on the bench, the work being brought to the iron instead of *vice versa*. This arrangement is often particularly advantageous in mass production soldering.

A common cause of trouble with electric soldering irons is overheating in the periods when the iron is left switched on but is not in active use. An overheated iron oxidises the work and solder; it leads to premature failure of the element and deterioration of the surface of the bit and may cause weakness in the soldered joint especially where copper is being soldered due to the formation of a brittle copper-tin compound in the joint.

The function of the soldering iron is to heat the work and to melt the solder. The correct temperature depends on the mass and kind of material being soldered, and the composition of the solder. The best soldering-iron temperature, providing sufficient heat for fast working without becoming so hot as to overheat the work or the bit itself,

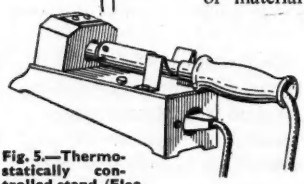


Fig. 5.—Thermostatically controlled stand (Elec. Soldering Iron Co.)

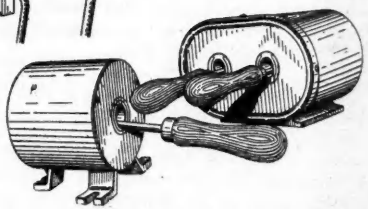


Fig. 6.—Heating stoves for plain copper bit (Westool)

is between 325 and 375 deg. C. and an iron capable of keeping within this range while working is very liable to overheat when not working. This is especially true of heavy-duty irons, which have much smaller ratios of surface area to watts input than have smaller irons. Thermostatic control of element temperature is doubtless the best and most obvious solution of this difficulty, but it remains to be developed.

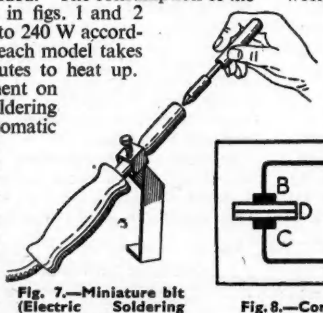


Fig. 7.—Miniature bit (Electric Soldering Iron Co. "Esico" type)

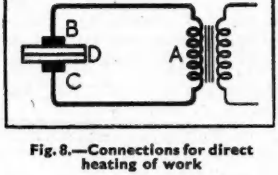


Fig. 8.—Connections for direct heating of work

A simple method of reducing the bit temperature is to place the iron on a stand like that shown in fig. 4 when it is not in use. The weight of the iron is sufficient to depress the pivoted lever A, open contacts B and so switch lamp C into series with the iron. This reduces the current so that a good temperature is maintained in the bit without overheating, and in addition the lamp provides an indication that the iron is switched on. When the iron is removed the stand rises, closing the contacts

and thus applying full voltage to the element.

Fig. 5 shows a stand developed in the United States in which the heat of the bit is limited by the operation of a thermostat in the casing surrounding the bit. With small irons, dangerous temperatures can usually be avoided by laying the bit on a block of metal when not in use.

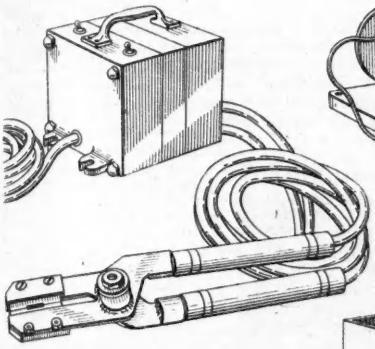


Fig. 9.—Portable direct-heating equipment (Stanelco Products)

Best service will be obtained from an electric iron if the following points are observed:—Use an iron of ample but not excessive capacity for the job in hand; switch off when not in use, or use a stand as described above; apply flux only to the *end* of the tip; never use an acid or corrosive flux; file up occasionally to prevent pitting.

Where a plain copper bit is preferred, heating in an electric oven ensures that the bit does not get tarnished due to contact with flame and that it is maintained at a correct temperature without risk of overheating. The irons should be of standard size and the heating elements designed to maintain them at the most suitable temperature for the class of work in hand.

For very light work, a miniature bit (fig. 7) is useful. This incorporates a unit similar to the ordinary electric soldering iron, but minus a bit, fixed in a suitable stand and a separate "pencil" iron is used for the soldering operation.

Direct Heating

A modern development in soldering practice is the direct heating of the work by electrical means. In fig. 8, A is a transformer having a low-voltage secondary connected to carbon blocks B and C, which are maintained under pressure on each side of the parts to be joined, D. Heat is produced by the passage of the current through the blocks and joint, and the solder is applied directly to the work without the use of an iron.

The remaining application of electricity to soldering is in the heating of dipping pots, which possesses the advantages of cleanliness and absence of fumes. As, however, the heater elements operate with a fixed watts input they suffer from the disadvantage of lack of adjustable temperature control—the watts input required for maintaining a nice degree of fluidity being dependent on the composition of the solder, which affects the melting point and the volume of solder. Too high a temperature causes excessive "dross" on the surface while too low a temperature will render the solder pasty.

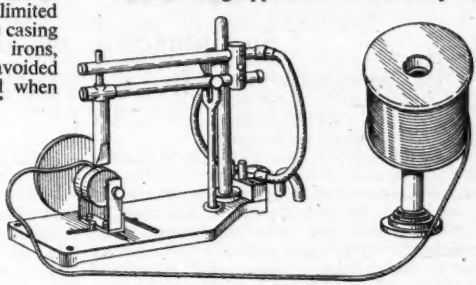


Fig. 10.—Treadle-operated bench-type electrode equipment

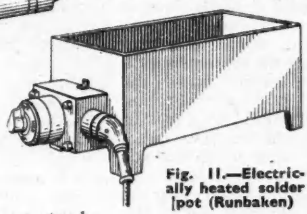


Fig. 11.—Electrically heated solder pot (Runbaken)

Aluminium Technology

THE need for accurate, up-to-date information on aluminium technology has increased very considerably as a result of the wartime expansion of industries concerned with the working and treatment of aluminium alloys. To meet this demand, particularly in view of the fact that improvements in technique are continually being made, the Research and Development Department of the Northern Aluminium Co., Ltd., has compiled a number of publications dealing with various branches of the subject. These publications are subjected to periodical revision and their number will be augmented in the near future.

Those available at the present time are given in the following list, copies being obtainable by applying to the Technical Publications Department of the company at its Banbury (Oxon) office: "Gravity Die Castings in Aluminium Alloys"; "Cold Forming of High Strength Aluminium Alloy Sheet"; "The Machining of Aluminium Alloys"; "The Heat Treatment of Aluminium and its Alloys"; "Protection of Aluminium Alloys during storage"; and "Specifications for Aluminium and Aluminium Alloy Products."

A. C. Vectors

Significance of the Operator j

By A. G. Powell, A.M.I.E.E.

THE representation of vectors by the symbolic notation method often gives rise to some confusion around the indentification of the symbol j with the square root of -1. Fundamentally, the vector is represented in terms of its rectangular co-ordinates on the horizontal x axis and the vertical y axis, the latter component being indicated by prefixing it with the symbol j. As far as the addition or subtraction of vector quantities, therefore, this symbol can be taken as an indication of the vertical components enabling them to be segregated.

The quadrant into which a vector falls is determined by the sign of its components. Thus, horizontal components are positive when to the right-hand of the y axis and negative to the left-hand; similarly vertical components are positive when above the x axis and negative when below. From this convention it can be seen that the movement of a vector from the positive direction along the x axis to the negative direction along this axis is equivalent to multiplying the original vector by -1 and also to its rotation through an angle of 180 deg. As $-1 = \sqrt{-1} \times \sqrt{-1}$, rotation through 90 deg. of a vector, is accomplished by multiplying it by $\sqrt{-1}$, and assuming its original position to be along the x axis in the positive direction, this will bring it along the y axis in the positive direction. Therefore the symbol j indicates rotation through 90 deg. and its sign the direction of this rotation.

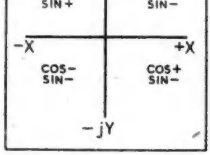


Fig. 1

The components of a vector along the x and y axis are simply its sine and cosine components, and the form of expression often used, such as $(x + jy)(-5 + j.866)$ consists of two terms, the first indicating the original vector, and the second the vector operator which rotates the vector to its new position. In this expression, the terms in the vector operator are the sine and cosine values of the angle through which the vector is turned. The direction of rotation is dependent on the sign given these terms and the signs determining the four quadrants are shown in fig. 1. A vector of unit length lying along the x axis in the positive direction would be indicated by $1.0 + j0$ and its combination with the vector operator to rotate it to the 60 deg. position by $(1.0 + j0)(.5 + j.866)$.

The significance of the operator j becomes apparent when dealing with the multiplication or division of vector quantities. These operations are carried out in accordance with the ordinary rules of algebra, but care must be exercised in allocating the correct sign, thus $(+j)(+j) = -1$ $(+j)(-j) = +1$ and $(-j)(-j) = -1$.

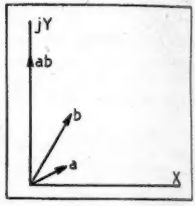


Fig. 2

For example, suppose as in fig. 2 vector a, to have a magnitude of 1 and to be at an angle of 30 deg. to the x axis, and vector b to have a magnitude of 2 and be at 60 deg. to this axis, then $a = (.866 + j.5)$, $b = (1.0 + j\,1.73)$ and their product, $a\,b = (.866 + j.5)(1.0 + j\,1.73) = .866 + j.5 + j\,1.5 - .866 = j\,2.0$. In other words, the resultant is a vector of magnitude of 2, lying along the y axis in a positive direction. This result is in accordance with the rule that the resultant of multiplying two vectors is a vector whose magnitude is the product of that of the two vectors, and its argument (or angle) is equal to the sum of the angles of the two original vectors.

Plant Extensions at Brisbane

WORKS planned by the City Electric Light Co., Ltd., Brisbane—for which purpose it is increasing its capital by £500,000—include an extension of the Bulimba power station by the installation of a 25,000-kW turbo-alternator and two 150,000-lb.-per-hr. boilers with steam conditions of 600 lb. per sq. in. and 850 deg. F. To meet growing demand in the metropolitan area the company is laying two 33-kV underground cables between Bulimba and a new 33-kV substation which will be built in the centre of the city. These cables will also be used for interconnection with the Brisbane City Council's power station at New Farm. Provision is made for the interchange of 18,000 kVA in either direction. Development outside the city area includes the construction of a main transmission line as far as Gympie, and the erection of distribution networks in the areas covered. It is also proposed to construct 110-kV lines north and west of Brisbane to supplement existing 33-kV lines. Since the company was granted its new franchise in September, 1939, it had spent £740,117 up to May 31st, 1941. New works in hand are estimated to cost £646,000.

PERSONAL and SOCIAL

News of Men and Women of the Industry

AT its last meeting Plymouth City Council discussed the salary of the city electrical engineer (**Mr. H. Midgley**). The Council had previously referred back a proposal that the salary should be increased from £1,400 to £1,520 per annum until March, 1942, and thereafter in accordance with the agreement of the National Joint Committee. Now the Finance and Establishment Committee recommended that in conformity with the Council's decision not to grant salary increases during the war, except in special circumstances, the increase should not be agreed to and the Council concurred.

Mr. F. Purser Fletcher, O.B.E., M.I.E.E., A.M.Inst.C.E., for some years Deputy Director of Electrical Engineering to the Admiralty, has retired after a long career with the Service, during which time he held many important posts both at the Admiralty and at H.M. Dockyards. He was personally associated with many outstanding advances in the electrical equipment of H.M. ships and naval establishments. Mr. Fletcher has been ordered a short rest and he hopes that he may soon return again to active work in the profession. His address, in the meantime, is Wolverton Manor, St. Lawrence, Isle of Wight.

Mr. F. Purser Fletcher

Captain F. C. Jarrett, of the s.s. *Fulham IV*, has received official commendation of his good services when his ship (one of the Fulham Electricity Department's colliers) was attacked by two enemy aircraft on January 5th last and drove them off with her armament.

Messrs. T. E. Wilkinson and **H. J. G. Blakemore,** who have been acting as charge engineers at the Fulham power station, have now been confirmed in that position with commencing salaries of £537.

Mr. W. A. Bowles has been appointed to the staff of the Fulham Electricity Department as maintenance assistant with a commencing salary of £325.

Mr. F. H. Whysall is retiring from the position of city electrical engineer of Belfast in March next, and last week the Electricity Committee recommended that he should be granted a pension of £1,503 per annum (two-thirds of his salary). Mr. Whysall has been at Belfast for just over fourteen years, but the Committee took into consideration his twenty-nine years' service in Great Britain.

Mr. G. F. Kennedy, whose appointment as Consultant to the new Controller of the Belfast electricity undertaking is reported on another page is the son of Mr. J. M. Kennedy, vice-chairman of the Electricity Commission. Mr. Kennedy, who is about thirty-one years of age, was educated at Oundle and Trinity College, Cambridge, where he took an M.A. degree in engineering. After serving a student-apprenticeship with the British Thomson-Houston Co. he joined Kennedy & Donkin in 1932 as assistant engineer and became a partner in the firm three years later. He has been engaged principally in supervising the developments of the Electricity Board for Northern Ireland although he has also looked after contracts for the Central Electricity Board.

Mr. W. J. Selley and **Mr. D. M. Balfour** have been appointed directors of Balfour, Beatty & Co., Ltd., and **Mr. H. W. Gill** and **Mr. A. L. Dryer** have been appointed joint secretaries of the company.

Mr. R. S. Montgomerie, having been promoted to take charge of the interests of the E.M.B. Co., Ltd., in London, the company has appointed **Mr. T. C. Sharp** as its representative at 147, West Regent Street, Glasgow, C.2 (telephone: Glasgow Douglas 4886).

The Cardiff Corporation Electricity Committee has appointed **Messrs. T. Willmott,** of Cardiff, **H. S. Holden,** of Sheffield, and **W. Ll. Williams,** of Pontefract, as shift engineers at salaries of £390 per annum.

Taunton Town Council has approved a recommendation to increase the salary of **Mr. L. V. Turner,** the borough electrical engineer, by £100 in accordance with the national agreement. Mr. Turner's present salary is £850 per annum.

Mr. E. C. Mekie has been appointed secretary of Edmundsons Electricity Corporation, Ltd.

Mr. J. Harley, A.M.I.E.E., has been appointed constructional engineer for the Western District of the West Midlands Joint Electricity Authority's Shropshire distribution undertaking. Mr. Harley has been mains records engineer to the Authority since 1930, and before this was on the mains records staff of the Yorkshire Electric Power Co. for 4½ years.

Mr. R. Wolfenden has been appointed to succeed Mr. Harley as mains records engineer. He previously held the post of l.v. wayleaves officer with the Authority.

Mr. G. V. Harrap, A.M.I.E.E., has recently been elected a member of the London Council of the Institute of Industrial Administration. He is already a member of that Institute's Committee on Post-War Planning for Industry. He has also been elected a member of the London Eastern Section Committee of the Electrical Power Engineers' Association. Mr. Harrap has recently become a part-time lecturer at Woolwich Polytechnic on management, administration, and workshop organisation.

Mr. G. H. Davies, who has also been elected to the London Council of the I.I.A., is also connected with the electrical industry.

Mr. J. R. Walker, A.M.I.E.E., assistant engineer in the chief engineer's department of the London County Council, retired on superannuation on November 1st. Mr. Walker entered the Council's service in 1903 and served in the Tramways Department until 1930 when the system was taken over by the London Passenger Transport Board. He was then transferred to the public institutions division, and since the outbreak of war he has

had charge of one of the five areas in which the work of the division dealing with special wartime problems has been divided.

Mr. F. Greenhalgh has been appointed temporary lighting superintendent of the new Lighting Department of Accrington Corporation.

Mr. J. Magnall, telephone manager in the Sheffield area for several years, has been appointed Man-Power Officer at Middlesbrough. He will also act as chairman of the local Man-Power Board.

Mr. A. L. Johnson, M.A., deputy-chairman of Richard Johnson, Clapham & Morris, Ltd., in his capacity of Master of the Worshipful Company of Tinplate Workers entertained at Vintners' Hall on December 2nd a number of distinguished men, including several fighter pilots who took a leading part in last year's Battle of Britain. A subscription was made by members of the Company's Court to R.A.F. charities.

Obituary

Mr. J. Priest.—We learn with regret of the death on December 14th of Mr. Joseph Priest, of Osler & Faraday, Ltd., who was very well known in the lighting fittings industry for many years.

Mr. R. E. Cowell.—The death has occurred of Mr. R. E. Cowell, of Middlesbrough, who retired recently from the post of secretary to the Cleveland Institution of Engineers. He had been a member of that organisation for about forty years.

Mr. A. C. McColm, whose death is reported from Johannesburg, was Deputy-Director of War Supplies to the Union Government. After many years in railway service Mr. McColm became commercial manager to the South African Electricity Supply Commission and later was appointed commercial manager of the Iron and Steel Industrial Corporation, afterwards becoming general manager.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Institution Membership

REGARDING the leading article in your issue of December 5th, it seems to me that what is required is not an "honours" paper; as you suggest, but some means of differentiating between the graduate who is purely a theoretical man straight from college or university, and the graduate who has works' experience, whether it be a full apprenticeship, or a "short" two-year post-graduate apprenticeship.

I find that though a graduate may have practical as well as theoretical training he is not able to obtain a responsible position because he has not previously held such a position. Truly, a queer state of affairs.

Wakefield. TWENTY.

Engineers' Salaries

A MOMENT'S reflection on the rapid growth of the electrical industry will serve to show what a debt the industry owes to its engineers, who, in no small way, have been responsible for its continued prosperity and technical progress; their skill is at once apparent in the diversity of modern electrical apparatus. Their commercial value to the concern is high indeed, since in the work of the engineering staffs is to be found the primary means by which products can be marketed at an economical price; no amount of marketing skill can compensate for inefficient or unreliable design where electrical goods are concerned. By its skill or otherwise the design office can influence the basic cost of an article more than any other single factor.

The engineering staffs are usually very small, numerically, in relation to the value of turnover for which they are responsible, and the industry could well afford a fair scale of wages to the people who have served it so well.

Mr. Andrews, and others, will be ill-advised to let their hopes of improvement rest in any possibility of a change of heart on the part of their employers; experience has shown that this possibility is so nebulous as to remain for ever an impossibility. The one real hope lies in federation, and by this means alone can engineers and scientific workers hope to realise the benefits to which their work, from both a commercial and social aspect, entitles them.

Birmingham. DESIGNING ENGINEER.

Telephone Shortage in Sydney

IN a recent issue of the REVIEW, reference was made to difficulties being experienced in Australia, both as regards existing telephone installations and normal development, owing to the difficulties of getting supplies of various components.

In particular, cords were mentioned and it was stated that the bulk of these, in the past, had come from Sweden and Switzerland. We would like to draw your attention to the fact that this information is not correct, as the bulk of the Commonwealth Postmaster-General's requirements as regards these components are manufactured in this country and probably something over 50 per cent. by this company. Owing to the present large home demand for telephone cords it has not been possible for export licences to be granted.

RELIANCE ELECTRICAL WIRE CO., LTD.
*Leyton, E.*10.

[We are glad to have this correction but have to plead in defence that, as we mentioned at the time, the statement was quoted from our Sydney contemporary, the *Electrical and Radio Merchandiser*.—EDS. ELEC. REV.]

Electric Boiler Plant

A Large Tasmanian Installation

AN outstanding example of the possibilities of electrically raised steam and water heating is represented by an installation at the Royal Hobart Hospital, Tasmania. It is believed to be the largest of its kind in the Southern Hemisphere. With the exception of a small portion of the control equipment the installation comprises material entirely manufactured in Australia by the Australian General Electric, Ltd.

The plant comprises three 350-kW steam boilers, for supplying the hospital kitchen, operating theatre, sterilisers, etc.; two 300-kW radiation units, with outgoing water temperature of 180 deg. F., for supplying the numerous hot water radiators throughout the hospital; and four 650-kW hot water tanks—built of copper plate—each of 1,000 gallons capacity. These tanks supply all the hot water requirements of the Main Block and the Nurses' Block, with outgoing temperature of 190 deg. F.

The heating elements are of the "Calrod" type, each rated at 10 kW. Though the installation has just been completed, the majority of the elements have been in operation for twelve months without a single failure. The steam units are fitted with pressure switches—being switched in banks of 175 kW. The radiation units are provided with thermostatic control, switching in banks of 150 kW and the hot water tanks, controlled by thermostat also, are switched in in banks of 325 kW. All units are fitted with back-up protection, so that failure of individual heat control devices will bring into action the master heat control pressure switches and thermostats.

The complete installation is designed for continuous unattended operation. For this purpose a master control panel is used, which switches banks of units on and off, depending upon requirements. This is effected by a selector switch, operating in conjunction with the thermostats, pressure switches, time switches and associated relays. The load is carried mainly during off-peak hours.

Supply is given via duplicate feeders at 11 kV, each circuit being controlled by an oil circuit-breaker and Type P.B. Metropolitan-Vickers induction overload relays. These breakers control three 1,500-kVA 11,000/415/240-V step-down transformers situated in a special room above the boiler house. The low-voltage supply is controlled by three 2,500-A oil circuit-breakers, and is fed from these breakers to the busbars, which run the full length of the boiler house, and feed all distribution circuits. Each distribution panel is fitted with a 3-pole contactor having instantaneous overload relays on each phase and one high rupturing capacity fuse for each heater.

The boiler room at the Royal Hobart Hospital

Earth protection is given by means of a Metropolitan-Vickers earth leakage relay operated from a transformer connected between the neutral and earth busbars. All wiring to heaters is neatly arranged in floor ducts.

Raising Coal Output

WHEN Mr. Robert Crichton, managing director of Scottish Oils, Ltd., presided over a joint meeting of the Lothians and Fife Branches of the Association of Mining Electrical Engineers held recently at Edinburgh he spoke of the national demand for increased production of coal and oil, and stressed the application of electrical and mechanical engineering to meet those demands. Mr. J. A. B. Horsley, formerly Chief Electrical Inspector of H.M. Mines Department, emphasised the urgent necessity of altering existing regulations to cover the vast development in designs of electrical apparatus and its use underground. The report of the Departmental Committee on the amendment of the regulations contained many recommendations which, he thought, would if adopted, produce a greater margin of safety in mining and improve the status of electrical personnel.

Information for Contractors

Payment for Christmas Work

THE Director of the Electrical Contractors' Association (Mr. L. C. Penwill) has reminded his members of the Government's request that all vital work shall be continued on Christmas Day and Boxing Day and points out that under the existing agreement double time has to be paid for all hours worked on Christmas Day and time-and-a-half on Boxing Day.

Fire Watching

As a result of correspondence between the Director and the Ministry of Home Security regarding the liability of contractors' employees to perform fire-watching duties under the Fire Prevention (Business Premises) (No. 2) Order, 1941, the Ministry has agreed "that if an employee attends at the premises merely for the purpose of reporting for instructions he might be regarded as not working on the premises, but if he were doing work on the premises at more or less regular intervals he might be regarded as working at the premises and would therefore be liable to do duty as a fire watcher."

Industrial Lighting

With a copy of the revised "Explanatory Notes for Lighting Engineers" issued by the National Industrial Electric Lighting Service, the Director has sent some remarks on the operation of the N.I.E.L.S. scheme. These state that only competent lighting engineers are deputed to give advice and they will take the I.E.S. Code levels as subject to a minimum of 6 ft.-candles as the basis for their recommendations, assuming the use of E.L.M.A. lamps and allowing for a depreciation factor of 1.43 for calculating service conditions.

Members of E.L.M.A. and E.L.F.A. will work in conjunction with an installation contractor nominated by the E.C.A. or the E.C.A. of Scotland, except when the factory nominates its own contractor or its own staff handles the installation. They will refrain from taking contracts including erection and wiring, but will be free to sell direct to factories which carry out their own installation work.

Control of Building

The attention of members of the E.C.A. is drawn to the schedule to the Order controlling building operations. It is specified in this that the Regulation covers "work done in the construction or reconstruction, alteration, demolition, repair, decoration or work for the purpose of providing water, light, heating or any other services, or work for the protection of a building against hostile attack. Any reference to work done in the repair of a building includes reference to work done as a temporary measure pending the repair thereof."

The Regulation also contains a provision that the restriction imposed on building work shall extend to maintenance work on a building, notwithstanding that the work does not form part of an operation which comes within the above definition.

It is provided that licences shall be obtained from the Ministry of Works and Buildings for all building work covered by the Regulation above a value specified by the Minister. Civil defence contracts for the Government and local authorities are not covered by the Order. Other work for local authorities may need a licence from another Government Department. Where any work is carried out in contravention of the Regulation the person at whose expense the work is done, the person undertaking the work, or any other person employed in an advisory or supervisory capacity shall be guilty of an offence against the Regulation.

Reservation

Mr. Penwill has also called the attention of E.C.A. members to the new Schedule of Reserved Occupations, and points out that the list of occupations excluded from the progressive age-raising scheme does not include any employees of electrical contractors. Applications for the deferment of the calling-up of men on the ground of their employment on work of national importance must be submitted by employers on Form N.S.300 by December 24th. It is also noted that no further admissions to the Register of Protected Establishments are being made after December 3rd.

Working Hours

The National Joint Industrial Council for the Electrical Contracting Industry has considered the problem of the reduction of the 47-hour week due to the impracticability of providing an effective black-out or the desire of workmen to restrict their activities to the "non-blackout" period. It recommends that employers shall do their utmost to maintain a working week of 47 hours within the customary starting and stopping times.

If this is found to be impossible, it is agreed between the E.T.U. and the National Federated Electrical Association that for a period extending not later than February 28th mutual arrangements may be made to restrict the meal-time. These would supersede any national or local requirements for the payment of extra rates for work done during the mid-day break.

Fires in Switch Houses

Protective Methods

By S. York, Graduate I.E.E.

ALTHOUGH major fires in power stations have been rare the extent of possible disturbance is increasing owing to the greater concentration of power in modern systems. The capital outlay involved in making adequate provisions for fire prevention and fighting is a decreasing proportion as the capacity of the station increases.

To limit the extent of a fire, and to ensure that the supply is affected as little as possible, segregation of the switchgear into sections is necessary. The best method, but too costly for adoption, is to enclose each unit completely in a moulded stone or brickwork cubicle. A simple division of plant into two parts, each in a separate room, is a practical compromise.

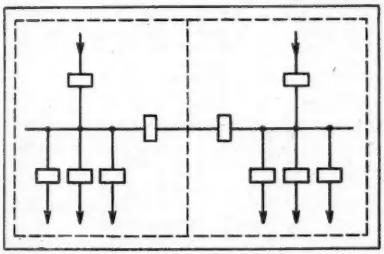


Fig. 1.—Switchgear in independent sections

An effective method is that shown in fig. 1, in which each section can be made independent of the other. The omission of one bus-section switch is false economy, as a fault on that switch may affect both sections. Only a fire in one section could be isolated effectively.

The best practicable method of segregation is shown in fig. 2. The sections are enclosed in buildings physically separated. One feeder from each switch house is run to each remote point. Duplicate busbars are illustrated, but

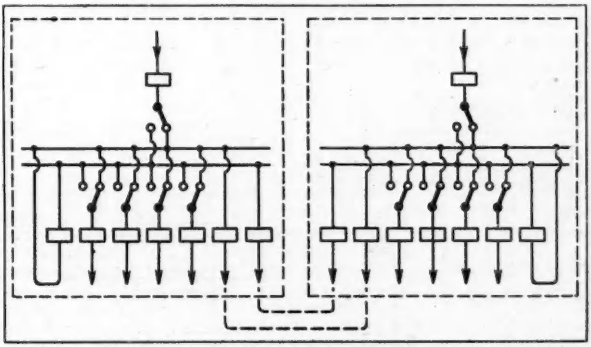


Fig. 2.—The best practicable method of segregation

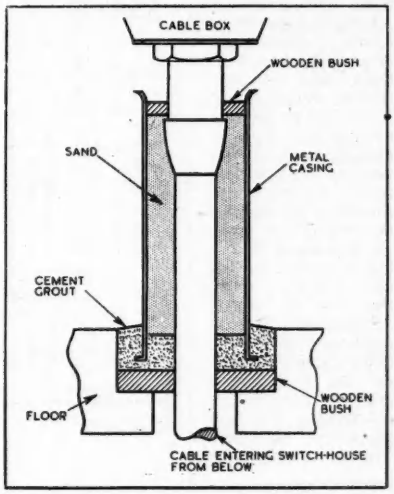


Fig. 3.—Sealing arrangement to prevent seepage of oil through floor

all the fire protection advantages are obtained with a single busbar arrangement.

Serious short-circuits, the usual origin of electrical fires, may cause rapid air expansion and the building should therefore include provision for quick relief of internal pressure, such as hinged window frames, free to move outwards. The roof should be of fire-resisting material, such as concrete, but if a pitched roof is employed it should be protected by a fire-resisting inner ceiling. As a means of draining off oil released from the switch-

gear, the floor, constructed of reinforced concrete, must be graded and provided with drain holes, filled with gravel or screened rubble. Brick dividing walls should not be less than 9 in. thick, and interconnecting doors should be of steel or be steel covered. Fittings holding the door in position must be fireproof. Internal doors should be self-closing, and where access to the switchgear chamber is gained by an iron stairway, as in the case of a basement switch house, the door must be at floor level, and the stairway fitted outside. A sill in the doorway will prevent oil seeping into an adjoining chamber. Control panels should never be mounted in the same room as their associated switchgear, and direct communication doors between control room and switch house must be avoided.

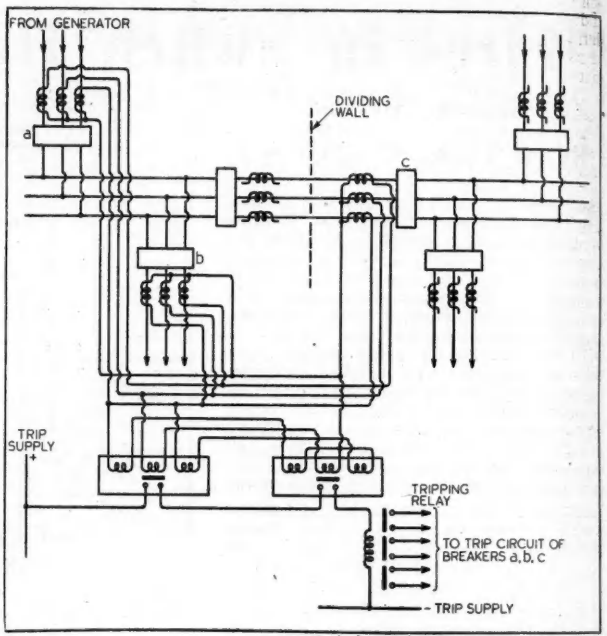


Fig. 4.—Differential system of busbar protection

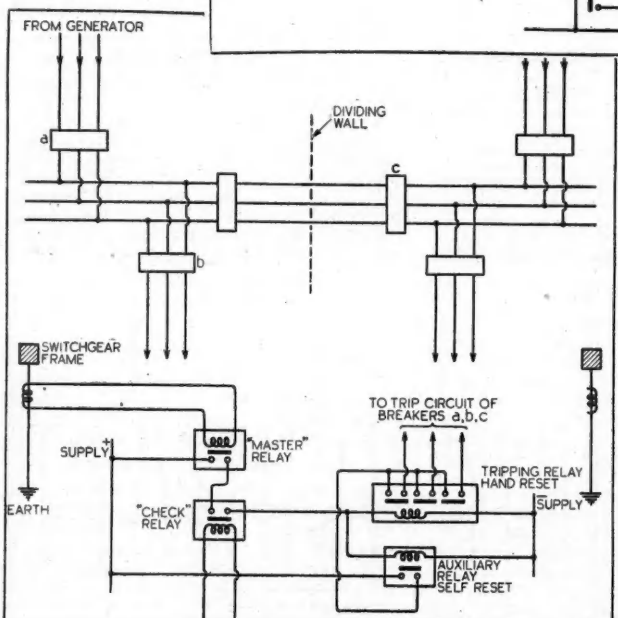


Fig. 5.—Leakage-to-frame protection system

When carbon-dioxide equipment is employed, windows should not be less than 2 ft. above the top of the switchgear. Otherwise the efficacy of the fire-fighting equipment may be reduced due to gas escaping through a broken window. A hinged sheet-steel shutter over the outside of the window

will act as a safety valve to internal pressure, and also be resistant to blast from outside during air-raids. External provision should be made for the safe storage of all combustible materials.

The presence of moisture in switch houses due to condensation is a common cause of insulation failure, which is the major cause of electrical breakdown. Moisture can be excluded by feeding only dried air into the switch house, or, alternatively, by warming it with thermostatically controlled heaters to keep its temperature a few degrees above dew point. In large switch houses these heaters may be disconnected by time switches during peak loads, when enough heat would be produced by the heavy currents carried.

Duplicate cables serving the same circuit should never be run along the same path. Tripping and control cables should not occupy the same duct as the main cable. Communication circuits should not be run through the switch house. Special heat resisting cables are available for all secondary circuits.

The outer hessian and waterproof covering should be removed from main cables at the point where they leave the ground. These coverings are valueless indoors, and in a switch house are a source of avoidable danger. Where cables are brought into the switch house from an underground basement the floor should be sealed to prevent oil seeping into the basement as, for example, by the method shown in fig. 3.

Busbar Protective Systems

Sustained arcing in the presence of inflammable material causes and aggravates fire. Owing to the intense heat produced by the heavy currents which may flow into a fault, manual interruption of supply is too slow and automatic protection is required. Overload and earth-fault devices on generators do not afford a high degree of protection because, in order to ensure discrimination on the rest of the system, the relays are set with a long time lag. Furthermore, a busbar fault may be fed from several sources.

Hard and fast rules cannot be laid down for the application of busbar-zone protective systems because the question of cost, importance, size and type of switchgear must be taken into consideration. The two essential points are that on the occurrence of a busbar fault all sources of supply shall be disconnected from the faulty section and that only the faulty section shall be isolated.

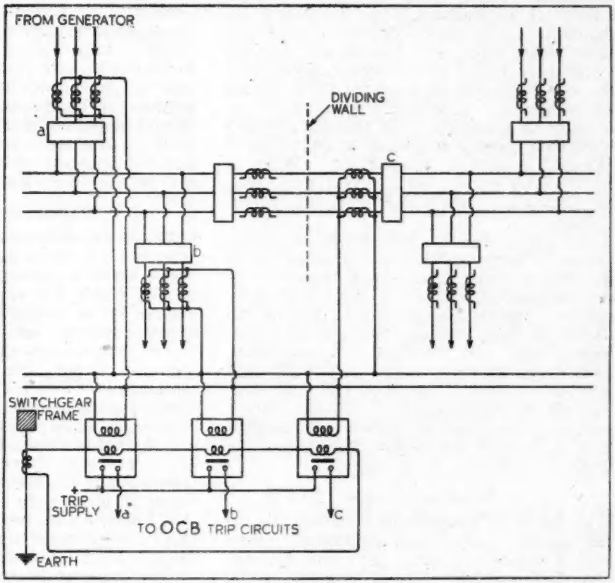


Fig. 6.—Combination of differential and leakage-to-frame methods

With sound metalclad gear the busbars are so spaced and insulated that any fault almost inevitably involves an earth fault, and protection against this type of fault only need be provided. Busbar protection schemes can be classified as follows :—(1) Differential methods. (2) Leakage-to-frame methods. (3) A combination of the these.

The schemes here briefly described embody the following features :—(*a*) Operation of two relays before the busbars are isolated; (*b*) tripping of all circuit-breakers controlling the faulty section; (*c*) provision for tripping the remote oil circuit-breaker which may feed into a busbar fault on the feeder side of a unit; (*d*) instantaneous action and stability on through faults.

A differential system of protection (fig. 4) relies on the equal values of the amount of power entering and leaving a healthy switchgear section. It consists essentially of balancing all the incoming currents against all the outgoing currents, and utilising the out-of-balance

current to operate two relays, which isolate the faulty section.

A leakage-to-frame system (fig. 5), owing to its simplicity, is particularly applicable to new switchgear. The whole of the switchgear framework is insulated from the ground by mounting it on a bed of concrete some two or three inches thick and clear of any earthed steelwork. Where metal-covered cables enter the switchgear special insulated cable glands are necessary. A resistance to earth of ten ohms or so is enough. The switchgear frame is earthed through a conductor on which is mounted a current transformer. When a busbar fault occurs fault current must pass through this current transformer and operate a relay.

To guard against inadvertent operation another current transformer is mounted in the main earthing conductor of the generator or transformer supplying the switchgear section. Busbar fault current in returning to its source flows through this current transformer also and operates a check relay. Breakers on the faulty section do not trip until both master and check relays have operated. To obtain discrimination between switch sections, these sections should be insulated from each other and earthed through separate leads to a common earth bar.

Combined System

In the third (combination) method (fig. 6) the essential feature is a differential system with a two-element relay per circuit-breaker. One element of the relay is connected to the parallel or residually connected current transformers and also to the relay bus wires. The remaining element is connected to the current transformer in the frame-earthing conductor. Before the relay can operate current must flow in both elements, and this can only obtain when a busbar fault occurs. A separate relay is used for each feeder, and thus accidental operation of a relay trips only its own circuit-breaker.

When choosing fire extinguishing apparatus the dominant consideration is certainty of fire extinction. Success depends, first, on the quickness with which the apparatus can be brought into play and, secondly, on the facility with which the extinguishing substance can be applied to the source of fire. A number of hand-operated fire extinguishers should be placed in easily accessible places in addition to equipment that will automatically come into operation on the outbreak of fire and at the same time give audible warning.

Extinction of Oil Fires

Oil used in circuit-breakers and transformers does not burn when flame is applied to it, but when heated it splits up into new substances, one of which is a vapour which reacts with oxygen in the air and produces a flame. An effective system is one in which a high-pressure water spray causes the oil to emulsify and prevents further splitting up, so that the production of inflammable vapour ceases, and the fire is extinguished within a few seconds. The water-spray projectors are attached to a pipe system and spaced a few feet apart round the area to be protected. The main disadvantage of this system is that it requires the water jet to get right at the surface of the oil.

Carbon-dioxide, being an inert gas, may be used for the quick smothering of a fire. It has the advantage that it can reach the source of fire wherever it may be without damaging adjacent insulation. It lacks the cooling qualities of other methods, and it can be effective only in an enclosed space.

A remotely controlled exhaust fan, for switching on after the flame has been extinguished, is very useful for expelling fumes from the switch house.

Students and the Call-up

Director-General's Statement

THE Director-General of Man-Power (Mr. G. H. Ince) last week broadcast some information about the position of students under the Government's new man-power scheme. He said that those who were taking scientific and technical courses with a view to proceeding to a university or other higher education establishment would not be called up, at least until they had completed their studies. In this way it was hoped to maintain a supply of men with a knowledge of engineering and radio work for industry and the Forces.

Those students who were taking their Higher School Certificate or similar examination at the end of the present school year would not be called up before that time. All other students would be called up unless they would thereby be caused exceptional hardship, when they could apply for a postponement for a sufficient period to avoid it.

University students who were taking certain scientific or technical courses would be granted such deferment as was necessary in the national interest. They would be required to make satisfactory progress and would have to undergo military training at the university. Those who were not taking scientific or technical courses but wanted to go on with other studies might, after calling up, be placed on the reserve for a year to enable them to pursue these studies. Students who had completed three terms at a university would be called up.

In the House of Commons on December 11th it was stated that the approximate number of students of scientific, technical and medical subjects in universities and university colleges in Great Britain was 25,000.

INSTITUTION PROCEEDINGS

Supplying Large Consumers. *African Lightning Studies.*

Installation Planning

PLANNING economically the electrical wiring of large buildings, such as stores, was the subject discussed in a lecture delivered by Mr. H. M. Winstanley (consultant) to the ASSOCIATION OF SUPERVISING ELECTRICAL ENGINEERS on December 13th.

It was quite possible that a combination of purchased electricity and generation upon the premises would be most convenient, but the lecturer remarked that suppliers of electricity did not seem to be favourably disposed towards such an arrangement and sometimes strongly opposed it. It was economical to employ purchased electricity for all services between certain hours and for some services all the time.

Maximum Economy

If the premises were at the centre of a town Diesel generation would be preferable to steam, with exhaust boilers coupled to the main heating system, which would be of the thermal storage type with electrode boilers time-switched under the electricity supplier's control. Throw-over switches would ensure that the main demand for purchased electricity occurred during off-peak hours and permitted the consumer's plant to be run at maximum economy. To install the latter merely for stand-by purposes would require elaborate automatic switching and special dividing up of the installation.

Turning to layout considerations, he said that certain electricity suppliers insisted on single-pole fuses and switches, although they would not permit the use of an uninsulated neutral and frankly stated that they did occasionally break their earth connection for testing purposes. They were therefore, in the lecturer's opinion, encouraging contravention of I.E.E. Regulation 110. That matter had been brought to the attention of the I.E.E. Wiring Rules Committee.

Rising Mains

Supply undertakings seemed to be making a practice of limiting the size of four-core cables to 0.3 sq. in. and duplicating them as the load necessitated, which often involved an expensive layout of switchgear for controlling the incoming supply. The importance of determining the positions of rising cables before the final architectural plans were completed could not be overstressed, and Mr. Winstanley described in detail with the aid of lantern slides a rising main arrangement devised by his firm which could be installed during the construction of a building and then plastered over, leaving the installation of wiring and distribution boards until after the plastering had been completed. It was equally suitable for busbars or vulcanised rubber or armoured risers.

The lecturer believed that there were only six multiple earthed systems, all laid out by his firm, at Leatherhead, Farnham, Egham, Hindhead, Chiswick and Sevenoaks. All had been in operation for many years without any of the prophesied troubles having occurred, and he looked forward to the time when multiple earthed systems would be universal. When an uninsulated neutral could be employed then "Stannos" and "Pyrotenax" wiring would be very suitable, although they suffered from the same drawback; if alterations had to be made, or wiring replaced, new runs would have to be installed. His personal opinion was that "Kalkos" was the most suitable system, consisting of brass tubing and fittings, which constituted the neutral conductors. Copper tubing and fittings might be used. In both cases tubes of smaller diameter could be employed, since they were smooth inside so that the insulated conductors did not need to be braided.

Finally, Mr. Winstanley considered that the time had come for the adoption of fresh methods, in collaboration with architects, claiming that many advantages would result from the removal of all pipes and ducts from the floors of buildings. Instead, he would accommodate them in false ceilings, with removable panels to afford access. Telephone and bell and signal circuits would be enclosed in wooden boxing fixed against the walls at floor level, forming a chair stop, and fed from the false ceiling through conduit recessed into the walls.

Lightning and Overhead Lines

INVESTIGATIONS into the magnitude of lightning currents and voltages on transmission lines in South and West Africa have already been reported upon in the I.E.E. *Journal* (vol. 88, part II, p. 69) and continuation in 1938-39 of the observations undertaken in 1937 is described in the paper "Measurement of Lightning Voltages and Currents in Nigeria" by Messrs. F. R. Perry and G. H. Webster (Metropolitan-Vickers Electrical Co., Ltd.) and Mr. P. W. Baguley (Mackness & Shipley) which was presented to the Transmission Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London last week.

The work described in this second paper was performed for the British Electrical and Allied Industries Research Association. The same

measurement station on the 33-kV lines (Plateau Province) of the Nigerian Electricity Supply Corporation, Ltd., was utilised, but the scope of the work was enlarged by employing three oscillographs and three klydonographs instead of single instruments, so enabling three-phase feeder records to be obtained. Also a continuous point-discharge record of the flow of current between earth and atmosphere during disturbed weather was made (analysed by Mr. J. Tudge of E.R.A.) while the number of magnetic links available on line poles and lattice masts for current measurement was increased to twice the number previously employed.

Front and Tail Values

The investigations provided a large amount of data for statistical analysis. Conclusions based on summarised results were that surges of all kinds exhibited a wide variety of equivalent wave shapes with front values ranging from 0.2 to 65 microseconds and tail values of from 0.9 to 93 microseconds, the shortest generally being associated with flashover. The ratio of tail to front lengths was generally limited in range from 1.2/1 to 4/1, though occasionally greater ratios were obtained. They were more or less independent of the magnitude of front and tail values, which were smaller than, for example, in the standard 1/50 microseconds wave normally used for impulse testing.

Most of the direct-stroke voltage records obtained were associated with flashover of the line insulation and consequent faulting of the power system. The complete sequence of events had not always been obvious ; three-phase records told a better story than single-phase ones did. In two instances records of the wave shapes of separate strokes in multiple-stroke flashes of lightning had been obtained, showing the familiar resemblance between such strokes. Klydonograms of lightning voltages had confirmed certain features of oscillograms, but in general the former were not so complete and less accurate than the latter.

Current Measurements

A number of current measurements had been made in cases of direct strokes to a line carried on tubular steel poles. In addition a comprehensive picture had been formed of the current distribution in the members of lattice masts, but one anomalous set of current measurements involving 18 lattice masts still awaited explanation. Pronounced double pulses observed on certain oscillograms of lightning voltages might be linked up with the current pulses in the main return lightning stroke, as predicted by Messrs. D. J. Malan and H. Collens.

Point-discharge records had confirmed many of the observations made at Kew and also revealed certain differences relating to storm activity, differentiating between tropical and temperate zone storms. A more complicated form of the Simpson-Robinson storm model could explain some of the phenomena observed on the point-discharge records.

Automatic Telephone Switching

THE tendency to replace manual operators by automatic switching equipment for setting up telephone calls has become extensive and world wide. In a paper, which they jointly presented at the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 18th, Dr. W. G. Radley (P.O. Engineering Department) and Mr. E. P. G. Wright (Standard Telephones and Cables, Ltd.) explained the preference for signalling and dialling by voice-frequency currents over long-distance circuits.

They commenced with a justification of the adoption of higher frequency currents (600 and 750 c/s) prior to which it had been the practice in Europe to use 500 c/s for signalling to switchboard operators. The latter signals could be transmitted over normal long-distance circuits with a loss of less than 16 c/s, which was a customary frequency for ringing a subscriber's bell, but the presence of 500 c/s in speech caused false signals and unnecessary intervention of the operator. In consequence time delay had to be introduced and the ringing current had to be modulated, or interrupted, by some lower frequency (16 or 20 c/s) because the occurrence in speech of the combination of high and low frequencies was of short duration.

Advantages of System

Signalling in this way over long-distance circuits provided a service similar to that of the magneto switchboard, long ago obsolescent, while complication was increased when several operators had to intervene in building up a call. The advantages of automatic signalling included speedier operation because of precise knowledge of the action of the distant end of the line. In addition the " outgoing " operator was saved the distress and delay liable to occur when plugging in to a long-distance circuit which had not yet been released from the previous connection at the incoming end.

The increase in the speed of setting up and taking down each connection improved the traffic handling capacity of the line plant. Provision of special recall and transfer facilities, which became possible when a range of different signals was available, simplified the operating procedure and avoided wastage of time and effort.

The main part of the paper was concerned with system design problems, including the various methods that might be used to avoid interference between signals and other currents in the voice-frequency range. Reference was also made to the recommendations of the

International Consultative Committee on Long-distance Telephony (C.C.I.F.) regarding means of avoiding interference between different signalling systems on international connections.

The authors summarised in tabulated form the relative advantages and disadvantages of various possible methods of signalling over long-distance circuits, including some that had not yet been submitted to the test of extensive practical use, as a basis of comparison of cost and complexity. Their review suggested that two-voice-frequency systems had certain outstanding advantages as regarded their capability of operating over any type of speech transmission path. They alone permitted through signalling when several trunk links were connected in tandem. In view, however, of interference between different sections of a built-up connection, the advantages of end-to-end signalling were considered to be problematical.

The increasing proportion of long-distance circuits to be provided by means of twelve-circuit carrier and wide-band coaxial cable systems merited, however, the consideration of other means of signalling specially adapted to such systems. Although limited in their application to carrier telephony circuits, they would advantageously avoid somewhat formidable difficulties due to speech interference.

Colliery Equipment

THERE was a disappointingly small attendance at a meeting of the Installations Section of the INSTITUTION OF ELECTRICAL ENGINEERS in London on December 11th when Mr. J. A. B. Horsley (formerly Chief Electrical Inspector of Mines) read the short paper on "The Rationalisation of Colliery Electrical Equipment," to which reference was made last week.

Dr. W. M. Thornton, in opening the discussion, said that the use of electricity in mines was probably growing more quickly than anything else and there was bound to have been growth which had become uneconomic. It might be a quarter of a century before the rationalisation which presumably was in the author's mind became universal, but it must begin somewhere. At the present moment the Institution was putting its house in order and was trying to rationalise itself and the industry by way of post-war planning. There was a well-thought-out scheme ready to be dealt with, but how? Perhaps the first step was conferences between the user and the manufacturer with the object of putting obsolete types of apparatus out of manufacture. At the same time, there were plenty of young manufacturers now making colliery electrical apparatus and it would be folly to stop those people making new types.

Mr. J. R. Cowie said that so-called "mining" switchgear was becoming more and more necessary for industrial application. In certain groups of industry it might be necessary to take explosives works precautions, but machining processes, no matter how carefully they were done, had about reached the limit at which flameproofness could be guaranteed in certain cases. Some manufacturers developed specialities purely from the selling point of view and not always in the best interests of the industry as a whole. A great deal of research work was being carried out, both by the Research Association and manufacturers, with the idea of further improving apparatus and standardising it. One manufacturer had spent not less than £2,000 on models of flameproof plugs and sockets for the Committee and, although all the manufacturers agreed, ten of them made the particular type of article, but three who were present when the design was decided upon went away and made something else.

Greater Co-operation

Some manufacturers were willing to group themselves together to manufacture these articles for the industry, but the scheme fell through because people were not attuned to passing information from one to the other in the manufacturing sphere. There was now much more co-operation, and some highly specialised products were being made in this way, individual parts being made by those firms which were best able to do so.

Mr. R. Nelson said that the pace of standardisation had quickened. He would like attention to be paid to oil switchgear. It was satisfactory to hear Mr. Horsley say he was in favour of standard voltage.

Mr. J. F. Stanley said that specifications generally were mainly directed to safety requirements rather than actual rationalisation, but the mining industry was primarily concerned with the ability of a machine to stand up to strenuous working conditions. The industry might think that the present specifications were not of so much value in that respect as they might be. A substantial reduction in types and sizes of cables should be made now without waiting until after the war. This was being done now in B.S.S. 480 for paper cables. The I.E.E., through its Installations Section Committee or the Post War Planning Committee, should take steps to see that Mr. Horsley's proposals were brought to the attention of the B.S.I., or any other proper body, in some official form so that definite action could be taken.

"Stubborn" Manufacturers

Mr. E. Ivor David said that there were still manufacturers with stubborn minds who were determined to maintain individuality so that users would have to go back to them again. As an instance of what could be accomplished by rationalisation he said there had been one meeting at which, with good will on both sides and a desire to simplify, in two hours 37 different types of wiring were reduced to seven

on a certain aircraft. He hoped that the suggestions made in the paper would be implemented in the near future.

Mr. A. J. McColgan said the Factory Department of the Home Office was very much interested in this question and it had followed the policy which the Mines Department had pioneered as regarded safety for many years. Many inflammable gases and vapours were encountered in industry generally, whereas in mines there was only one. Regarding signalling bells in relation to inflammable gases, the Factory Department put a new specification before telephone manufacturers and they very willingly collaborated. Unfortunately, owing to the war, nothing further had been done. Mr. Horsley seemed almost to be asking for a wholesale revision of British Standard Specifications. The war was causing manufacturers to carry out a great deal of standardisation voluntarily.

Mr. H. Watson Jones said that very early in the war the Mines Department set to work to reduce the number of varieties of cables, but its efforts did not meet with very much success. Mr. Horsley had set the problem and it would be interesting to hear what cure he suggested.

Author's Reply

The author, replying to the discussion, said the paper was in no sense inspired, or authorised in any way, by the Mines Department. A wholesale conversion of voltage, such as had taken place when frequency was standardised throughout the country, was, in his view, quite impracticable within the economic powers of the mining industry by itself. However, where new plant was being installed a useful start could be made towards ultimately reaching complete standardisation.

He had deliberately restricted his list of specifications to those peculiarly designed for mining conditions. Whether rationalisation should start before the end of the war, or afterwards, was not within his province; but he saw no reason why the interested parties should not get together now by way of making a beginning, and decide whether it was practicable to make a start now.

Infra-Red Drying

PHYSICAL aspects of the effects resulting from the utilisation of infra-red radiation for industrial drying and heating were reviewed in the first part of a paper by Mr. R. Maxted (B.T.H. research organisation) presented to the ILLUMINATION ENGINEERING SOCIETY in London on December 9th.

The second part of the paper discussed sources of radiant energy and some of the engineering considerations involved in designing and applying the equipment. For present practice which, according to the author, was concerned largely with the drying of paint and water films and heating iron and steel sheets, the continuous spectrum of a filament lamp could be successfully used. He went on to explain the effects of temperature on radiation and to illustrate the characteristics of various sources.

In designing equipment a high utilisation factor was aimed at; from 50 to 90 per cent. of the incident energy, depending on colour, might be absorbed in paint baking. The manner in which such absorption took place was important, much depending upon the release of heat at the most suitable point. Processes might often be greatly hastened by infra-red treatment, the time being reduced in some cases from 60 to five minutes without deteriorating the quality of the enamel finishes hardened in this way.

The four main engineering problems encountered were concerned with the measurement of energy, determination of the flux density required, design of reflectors and the planning of installations, the last-mentioned being relatively simple when parabolic reflectors would suffice for treating plain surfaces. In practice flux densities might range between 0.5 and 10 W per sq. in., densities between 2 and 3 W being widely employed. Estimation of flux densities necessary to maintain the desired temperature gradients in complex installations might be done empirically by calculation, whereas radiation could be measured with the aid of thermo-couples.

The last portion of the paper discussed in more detail the design of reflectors and the laying out of installations with particular reference to the building-up of heating tunnels for specific tasks.

Plastics in Engineering

FUTURE uses in engineering generally of what were now known as plastics could not be predicted in terms of existing materials alone, said Dr. A. Caress (I.C.I. Plastics, Ltd.), in a paper which he submitted to the NORTH-EAST COAST INSTITUTION OF ENGINEERS AND SHIPBUILDERS at Newcastle-on-Tyne on December 12th.

The author's qualitative survey of physical properties in relation to chemical composition and molecular structure, together with the properties and applications of existing types of materials, led him to the expectation that much wider use would be made of them as general engineering materials, particularly by utilising controlled linkages between molecules and the marked increase of strength resulting from cold drawing.

One of the author's predictions was that extrusion of insulating plastics round wires and cables and as sleeving was bound to supplement the more complicated methods of insulation; he believed that they would approach considerably nearer to metals in hardness, elasticity, toughness and strength.

Rural Areas

Post-War Electrical Development

By H. Greaves

THE main obstacle to widespread development in rural areas is economic because, unless the large farms take a supply, the annual revenue is usually inadequate to meet the cost of high-voltage distribution, which is essential to success. Much harm has been done in the past by affording supplies to farms from existing low-voltage systems which soon became overburdened, thus limiting the use of electricity.

The slow progress during the last ten years has been mainly due to the disinclination of prospective consumers to contribute or guarantee such sums as would make the development a remunerative one, indicating that future development can be hastened only by cheapening the cost of construction and adopting a more vigorous sales policy. Questions of cost must, however, be related to the high standard of reliability essential to successful rural electrification.

One tendency which, to my mind, is not likely to assist development is the adoption of single-phase distribution, any saving in first cost being offset by other factors. Apart from its inherent inefficiency, compared with three-phase distribution, there is the inferiority of the single-phase to the three-phase motor. Moreover, much has been accomplished in mass production of three-phase motors and switchgear, so that they are much less expensive than single-phase apparatus for the same duties. Must the manufacturers now tackle the problem again and mass-produce a commodity which, because it is to be used solely in rural areas, cannot have a wide sale?

The extension of rural electrification after the war depends on a number of factors, but mainly on a radical revision of ideas on the part of supply authorities

Drastic Tariff Revision

A vigorous sales policy must include a drastic revision of tariffs in certain areas, particularly as regards the high standing charges imposed upon farm premises—charges which bear little relation to the maximum demand or, at any rate, to the effect upon the system peak. Though revision of tariffs will achieve a measure of improvement by the increase both in the number of consumers and the consumption of each, this alone is not enough. Personal contact with the farmers is necessary and this means the employment of the right type of men by the undertaking. A farmer, whether engaged in agriculture, horticulture or poultry farming, must be given sound advice by a specialist and it must not be forgotten that the farmhouse may be the starting point of many a large scheme.

Some supply authorities have been content to employ salesmen at a meagre salary, perhaps 45s. per week, with the addition of commission for business obtained. Commission payment suffers from many obvious disadvantages. A salesman is only human and the prospect of selling a £100 refrigerator at 5 per cent. commission is more alluring than trying to convince a tenant farmer that it is in his own interest to contribute £50 towards the cost of a supply line.

There can be no standard formula for farm development, for the type of load varies according to the area and indeed even within the same county. For example, in Cheshire there is a high proportion of dairy farming together with pig rearing; in Kent during one period of the year electricity can be used for hop drying with a load factor approaching 100 per cent., while other areas may be largely given over to crop growing or poultry farming.

Any attempts at rural development must take into account the fact that town and country are no longer isolated. It must not be assumed that people living in the country do so of necessity or have low incomes; many live there from choice. The bus and the cheap car have enabled the town worker to transfer his home into the country where he can live in healthier surroundings. At the same time he still desires urban comforts and is therefore a keen supporter of electrification.

Although the farm worker cannot be a large consumer, there is no reason why he should be restricted to the use of electricity for lighting. I recall one excellent tariff which was available in the Weald of Kent to all people living in property rated at £15 per annum or under. The fixed charge was a maximum of 1s. per week and the kWh charge was 1d., falling to ¾d. when cookers were installed. Thus the consumer was encouraged to install such small heating appliances as irons, kettles, wash boilers, as well as mains radio, assuring a steady return to the undertaking all the year round. A fixed charge based upon the number of assessable rooms is responsible for the loss of a considerable amount of business.

A wide field exists in the rural areas for water heating, both domestic and industrial. In my opinion too much importance is attached in many cases to thermostatic control. Take for example the small storage heater usually fitted adjacent to the kitchen sink: the unlagged type with a loading of 1.5 kW arranged for

hand switching will provide enough water for washing up in ten minutes after switching on. This is just what the average housewife wants; furthermore, she knows exactly what the service is costing, and the initial cost is less due to the absence of thermostat and lagging. The thermostat is a valuable asset to certain methods of water heating, but we should not get into the habit of thinking that it is an essential part of all water-heating schemes. It is no use telling a consumer that he can obtain a hot bath for 4 kWh if the daily losses exceed this figure. We have not yet reached the stage when houses can be supplied with hot water at a fixed weekly rate, and the average consumer cannot afford a hot water service at the tariffs prevailing in most rural areas.

Electric Cooker Design

The electric cooker has undergone no marked change in design for a number of years apart from minor details, certain of which I consider of doubtful advantage, such as the change from the enclosed to the radiant type of hot plate. My wife has had over ten years' experience of both and much prefers the enclosed type, which also has the advantage for the undertaking of lower maintenance charges. The large sale of " baby " cookers during the last few years has possibly been due to the habit of getting meals out and preparing only snacks at home. They are very useful if skilfully handled, but to my mind the only satisfactory cooker is a full-sized one.

Many appliances termed " wash boilers " are nothing more than containers fitted with immersion elements. These give consumers an entirely wrong impression of the value of electric water heating and cause it to be condemned as too slow.

One drawback to the adoption of electricity on large farms is the cost of wiring. The solution of this problem involves, in the first place, a tariff of the " all-in " type, in order that the supply may be tapped at suitable points without having to worry about metering. I see no reason why a ring main cannot be run round the buildings. This main could consist of p.b.j. conductors secured to poles or taken through the buildings, and if supplied from both ends the voltage drop would be kept to the minimum. Such a system would be of great value when extensions were contemplated. More wiring can be done on the cleat system than hitherto for both lighting and power.

Convincing the Farmer

Appreciation of the possibilities of electrification calls for familiarity with the state of agriculture in this country about the year 1929, when farmers were experiencing a lean time. Between 1923 and 1932 nearly 100,000 labourers were driven off the land and but for subsidies and marketing schemes the future of the industry would have been gloomy indeed. Subsequent policy brought about a marked improvement in conditions and to-day the farmer is, in many cases, assured of a fixed price for his products. At the same time, the margin 'twixt profit and loss is often very fine and the farmer must be satisfied that the adoption of electricity will be to his advantage financially, either by enabling him to market his products when prices are high or by giving him a better product and thus ensuring a higher average price throughout.

The scope for the electric heating of piggeries does not seem to be great, when it is considered that the average profit per pig is only between 5s. and 10s. In the poultry industry the annual profit per bird is so small that the question of convenience is not entertained by the farmer, but here sufficient data on the advantages of electricity for lighting and incubation are available to satisfy the most sceptical. There appears to be scope for further development in dairy farming, chiefly in respect of cooling, sterilising and the use of hot water for washing utensils. In cleanliness, a point that should appeal to the farmer, electricity offers a big advantage over older methods.

Much depends upon the tariff available as the appliances concerned are not worked at a high load factor. This may mean limitation of use to off-peak periods.

Thus the chief factors to be considered in rural development are a broad outlook by the supply authorities, better co-operation between them and the manufacturers, and the realisation by the farmer that science has a big part to play in his business.

Lightning Identification

COMPARING the scars it leaves on metallic objects with a master file of similar scars made by laboratory lightning of known characteristics is claimed to have furnished evidence that lightning strokes to earth seldom exceed 200 coulombs, with average strokes of about 25 coulombs, according to Dr. P. L. Bellaschi, Westinghouse transformer engineer, Sharon, Pennsylvania.

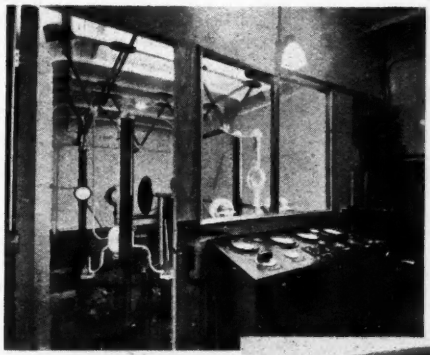
To obtain laboratory samples of typical imprints, a surge generator of three million volts is directed at targets. A catalogue file of several hundred " fingerprints " has been collected to supplement records made with the fulchronograph and cathode ray oscillograph.

Microscopes and calipers are used to measure the extent of melting. Pictures may be taken of the lightning dents and enlargements made of them for closer study. These scars furnish definite clues as to the type of lightning that has caused them. Signs of crushing force and shattering indicate " cold " lightning, which consists of a large current discharge lasting possibly 200 millionths of a second. " Hot " lightning is characterised by melting and burning by a small current of long duration, sometimes lasting nearly a second. In lightning discharges to earth, the two appear frequently together in various amounts, the cold lightning component followed by the hot. The information collected has influenced the design of Westinghouse lightning arrestors.

Cable Testing on Site

Birmingham's Mobile Equipment

FOR DC high-voltage pressure testing and location of faults on cables up to and including 33 kV, the City of Birmingham Electric Supply Department some eighteen months ago put into commission a mobile cable-testing equipment. The van body, which is mounted on a 35-HP petrol-engine-driven chassis, is divided into three sections composed of the driver's cab, an operator's compartment and a high-voltage compartment for housing the testing equipment and discharge apparatus.



A single - phase 230-V, 9-kVA generator, which can be operated when the vehicle is stationary by a flexible shaft driven from the engine gearbox, supplies current to operate the testing set, as well as for lighting and heating when public supplies are not available. Its speed is maintained within ± 2½ per cent. of normal by a centrifugal governor. In addition a hand regulator in the driver's cab enables one man to maintain the output voltage constant. The control cabin contains the means of operating the cable-discharge apparatus. A door communicating with the high-voltage compartment is provided with interlocks and cannot be opened until the high-voltage supply has been switched off.

Screening Methods

The van body has double walls of steel-faced plywood, all sections of which are bonded to a copper strip brought out to an earthing terminal at the rear of the van, thus completely eliminating electronic fields. The van can, therefore, be left unattended when fully charged. Tubular heaters permit the use of the apparatus under adverse weather conditions.

The glass rectifier valve set, arranged on the Callender-Smith principle, is designed to give a DC voltage up to 180-kV to earth, and is used chiefly in testing 33-kV cables. In addition a "Standard" selenium rectifier gives a DC voltage up to 80 kV between conductors and 40 kV to earth; this is used chiefly for 11-kV cable tests. The glass rectifier valves have been found to be more suitable for breaking down weak spots in 33-kV cables before making the location test, as the inherent characteristics of metal rectifiers cause them to heat up considerably when overloaded.

This testing equipment has been in use practically every day since being brought into commission, having run 11,380 miles and carried out 1,200 tests up to the end of November last. The routine pressure testing of all high-voltage trunks and ring mains has now been carried out in Birmingham for several years, and has undoubtedly been instrumental in reducing the number of cable breakdowns in service.

Part of the equipment of the Birmingham cable testing van and (below) an exterior view

This mobile equipment was supplied by Ferranti, Ltd., to designs prepared in collaboration with the engineers of the Birmingham Electric Supply Department.

Power from the Tiber.—The construction of big plants, drawing their power from the Tiber and lakes in the hills, is shortly to be undertaken by two companies under an agreement sponsored by the Ministry of Public Works, according to the official Italian agency. It is expected that the annual production of electrical energy will amount to 1,000,000,000 kWh.

COMMERCE and INDUSTRY

Steel and Paper Salvage. Higher Engineering Wages.

Salvage—Urgent

AN appeal for greater efforts in the salvaging of scrap metals has been made by the Ministry of Supply. It is pointed out that the importation of scrap iron and steel has virtually ceased except for the completion of a number of old contracts.

In these circumstances all engineering concerns, particularly, should make a thorough search of their shops, stores and yards for all obsolete machines, spare parts and all the bits and pieces which accumulate during the years, and turn them out to serve some useful purpose.

While on the subject of salvage we will take the opportunity of referring once more to the urgent need for paper for the production of munitions of war. We will assume that all our readers who have read our continued appeals will have taken steps to dispose of their accumulated waste paper. But we want them to recognise that the turning-out process should be a continuous one; it is better to dispose of unwanted paper week by week than to allow it to accumulate for a few months before seeing to it. By this means valuable space is kept free, and, besides, it is easier to decide what can be disposed of if small lots are dealt with at a time.

Engineers' Wages Increased

On Thursday last after a hearing of several days the National Arbitration Tribunal awarded a flat-rate addition of 5s. a week to the basic wages of men engaged in the engineering and shipbuilding industries to take effect immediately. The Amalgamated Engineering Union and other unions concerned had applied for an advance of 4d. an hour or 15s. a week.

The award will apply to youths and boys in the industry under the proportional arrangement which exists. Nearly two million men will benefit from the award.

Recruiting Women for War Work

No one will dispute the fact that the electricity supply industry is playing its full part in the national war effort, even in matters little connected with its normal activities. A further example of this has been provided recently at the Ealing Electricity Department's showrooms, where for three weeks a window facing the Broadway and a portion of the main showroom have been placed at the disposal of the Ministry of Supply for use as a recruiting office for women to work in war factories.

A recruiting office for women for war industries opened at the Ealing Electricity Department's showrooms attracted a good deal of attention. On the right a tapping machine is being explained to a prospective worker

Excellent results have been achieved and already over 300 women have been signed up, apart from many hundreds who are "thinking it over." An official told us that women generally had an "inferiority complex" regarding machinery, which they considered too complicated for them to understand. A demonstration on typical machines or even the actual performance of operations themselves soon convinced them of their mistake. To draw attention to the recruiting office loud-speakers enabled announcements to be heard all along the main road.

Incidentally the operators, as well as the machinery installed which included drilling, tapping and spot welding apparatus, were provided by the Gramophone Co.

Export and Transhipment Control

Under the terms of Board of Trade Orders made on December 8th, which came into force with

immediate effect, all export and transhipment licences for goods consigned to any of the following destinations have been revoked:—Japan (including Karafuto), Chosen (Korea), Manchuria, Kwangtung Leased Territory, Taiwan (Formosa), Japanese Mandated Islands, Japanese Islands, China, except *via* the Burma Road, Macao, Portuguese Timor, Thailand, and French Indo-China.

The Central Register

Replying to a question in the House of Commons on December 11th, the Minister of Labour and National Service said that as soon as the necessary arrangements could be made the Central and Supplementary Registers were to be merged in a new Appointments Department of the Ministry. This department would deal with persons with specified administrative, managerial, professional or technical qualifications and with others who, while not possessing specific qualifications, earned salaries exceeding £420 per annum. It would operate through staff at headquarters or under the Regional Controllers, according to the nature of the vacancies or the candidates. A separate register would be maintained of persons within its scope who were known to be seeking an engagement and an endeavour would be made to find them suitable employment in some form of national service.

Non-Statutory Supplies

Mr. J. E. Green, chairman of the Association of Non-Statutory Electricity Suppliers and Distributors, has sent us a copy of a report circulated to the Association's members. This mentions discussions with the Electricity Commissioners and the position of non-statutory undertakings in post-war electricity distribution. In the latter connection reference is made to the terms of compensation for dispossessed "non-stat" undertakings in the Electricity Supply Act (Northern Ireland), 1931. Correspondence is reproduced between the Association and an authorised supply company in which the latter declines to make an offer for a "non-stat" undertaking in its area.

Exports to New War Zone

The Export of Goods (Control) (No. 42) Order, 1941, extends the control of exports to the Southern Pacific area, including Thailand, Hong Kong, the Philippines and the more important islands in the new war zone.

Imports into Kenya and Uganda

Licences are now issued for the import of certain goods into Kenya and Uganda on the basis of minimum requirements only, and provided the goods are not equally available from another more convenient sterling source. Importers are informed that if non-permitted goods are allowed to arrive, clearance will be refused. The restrictions apply equally to goods of United Kingdom origin imported ex stocks in other sterling areas, and operate with effect from June 20th last. The goods affected include essential electrical machinery, wiring and electric cookers, lamp bulbs, and wireless sets (not including radio-gramophones) and spares. The following are examples of articles which will not be permitted:—Toasters, smoothing irons, lamp-shades, torches, and similar non-essential items.

Rubber Control

The Minister of Supply has made an Order placing under licence as from December 12th the acquisition and disposal of crude rubber, including liquid latex, gutta-percha and balata. Licences are obtainable from the Rubber Control, Vincent House, Vincent Square, London, S.W.1.

Fluorescent Lighting in a Footwear Factory

Four hundred Mazda 80 W, 60-in. fluorescent lamps housed in Mazdalux reflectors provide the lighting for the large footwear factory of Geo. Webb & Sons, Northampton. The careful planning of this installation, which was carried out by Hutchings & Cunnington, electrical engineers of Newland, Northampton, has resulted in great improvement on the previous lighting.

Mazda fluorescent lamps in the shoe room of Geo. Webb & Sons, Northampton

A Coming-of-Age

In sending us the season's compliments the Z Electric Lamp & Supplies Co., Ltd., reminds us that it has just completed twenty-one years of trading. We wish the company many more years of service.

Future of Farming

Speaking to the Farmers' Club in London recently, Alderman E. G. Gooch foreshadowed further mechanisation of the farming industry, with every village and farm electrified. He considered that the expansion of British agriculture would not necessarily mean a much larger number

of men on the land because those already engaged in this work were capable of producing much more than at present. In his view farming would be recognised as a science, and farmers would be constantly on the watch for new methods and possibilities. This would entail more research, the study of agriculture in the laboratory, and a high degree of education for both farmer and worker.

Ceylon Import Prohibitions

According to the *Board of Trade Journal*, the "Ceylon Government Gazette" of August 1st contains copies of two Orders which prohibit the importation into Ceylon of certain goods. These Orders cover goods, the importation of which, when grown, produced or manufactured in Canada, Newfoundland or any territory or place not forming part of the British Empire, is prohibited, and goods the importation of which when grown, produced or manufactured in any territory (other than Canada and Newfoundland) forming part of the British Empire is prohibited except under licence.

Trade Announcement

The New Insulation Co., Ltd., has opened a London office at 3, Central Buildings, S.W.1 (telephone: Abbey 6494) under the direction of Mr. E. Oxley, Inquiries from London and the Home Counties may be sent to this address.

Change of Name

The name of Hopkinson's Motors & Electric Co., Ltd., has been changed to Hopkin Motors & Electric Co., Ltd.

New Zealand Electrical Imports

During July last electrical imports into New Zealand were valued at £165,478 (against £139,772 in June). Insulated wire and cable was the principal item; of the total of £32,063 Great Britain was credited with £29,191. Electric motors were valued at £18,238 (United Kingdom, £12,483; United States, £4,641) and electric lamps at £11,052 (United Kingdom, £8,640). Imports of radio apparatus were valued at £19,036.

Calendars

A colourful picture of Poole Harbour decorates the calendar with monthly sheets, which also show the preceding and following months, sent to us by W. T. Henley's Telegraph Works Co., Ltd.

A feature of the calendar, with monthly sheets, sent to us by Milne & Longbottom, is that the charming picture of a scene near Aberdaron, which decorates it, is printed on silk.

TRADE MARK APPLICATIONS

THE following applications have been made for British trade marks. Objections may be entered within a month of December 10th :—

THE AIRSCREW CO., LTD. (design). No. 616,322, Class 7. Windmills for generating power, and parts thereof. Also No. 616,323, Class 11. Ventilating fans: and ventilating, heating, drying, refrigerating and air-conditioning apparatus. Airscrew Co., Ltd., Grosvenor Gardens House, Westminster, London, S.W.1.

MIRROID. No. 616,622, Class 9. Electrodes for electric arc welding.—Quasi-Arc Co., Ltd., Grosvenor House, Park Lane, London, W.1.

LENFERITE. No. 616,603, Class 11. Electric furnaces.—John A. Grey & Partners, Ltd., Bush House, Strand, London, W.C.2.

SEMPERATUS. No. 616,864, Class 11. Heating and ventilating installations.—Sulzer Bros. (London), Ltd., 31, Bedford Square, London, W.C.1.

TENAPLAS. No. 612,216, Class 17. Insulating material.—Tenaplas, Ltd., 7, Park Lane, W.1.

Controller Appointed in Belfast

AS a sequel to the breakdown of negotiations for the co-ordination of electricity supply in Northern Ireland, the Minister of Commerce has made a statement in the following terms:—

"I have for some time been considerably concerned as to how to get the best war effort out of the Belfast electricity undertaking. This concern has been shared by the Ministries at Westminster, including the Ministry of Supply, from whom I have received strong representations on the subject. I had hoped a solution of the difficulties could be found by an amalgamation of all electricity undertakings in Northern Ireland under a new public utility board responsible directly to me. The Corporation of Belfast were unwilling to agree to this step.

"I have therefore made an Order under the Defence Regulations appointing an authorised Controller to control generally the undertaking in the interests of the National effort. The operation of the Order should not of itself increase the cost of electricity to the consumer beyond what would have taken place due to war conditions had the Corporation duly performed their obligations as electricity undertakers."

The Controller appointed is Mr. Hugh Boyd, F.C.A. He will be assisted by Mr. G. F. Kennedy (Kennedy & Donkin), who will act as consultant.

In reply to questions last week the Minister said that he had made up his mind that the Corporation's organisation while suitable for peacetime purposes could not now produce the desired results. The Controller would have general supervision but the Corporation Electricity Committee would remain in being and retain ownership. The Controller would, however, have power to over-ride a decision of the Committee and would have the last word in matters of policy. Any member of the Committee who refused to abide by orders given by the Controller would be guilty of an offence under the Defence Regulations. The Londonderry undertaking would not be affected in any way.

He went on to say, according to the *Belfast Telegraph*, that "it would be realised that during the war he could not possibly give the reasons why he was doing this because it would not be in the public interest. The merger for the moment was dead, he regretted to say, but in his opinion it was the right solution."

At its meeting on December 9th the Belfast Electricity Committee decided to recommend the Council to apply for sanction to borrow £110,000 for additional plant to meet the needs of the Department.

ELECTRICITY SUPPLY

Further Price Reductions. Retention of Bridgend Plant.

Barnes.—LOWER CHARGES.—The Electricity Committee is recommending a temporary reduction in electricity charges.

Barrow - in - Furness. — EXTENSIONS.— The Corporation Electricity Committee is to extend mains at a cost of £862.

NEW PLANT.—In addition, the Committee is to provide further switchgear, transformer and feeder for the improvement of the system in the rural area at a cost of £13,830.

Blackburn.—RESIGNATION FROM ADVISORY BOARD.—The Corporation has decided to sever its connection with the Mid-Lancashire Electricity District Advisory Board.

Bradford.—RESTRICTED SUPPLY CHARGES.—The Electricity Committee has empowered the electrical engineer to negotiate special terms for the supply of electricity to consumers who are prepared to undertake not to make use of the supply between certain hours to be specified by him during the months of January, February, November and December.

The Committee has approved a revised scheme for the improvement of electricity supply in the Clayton area.

Bridgend.—OPERATION OF PLANT.—The Council recently considered whether, in view of rising costs, the generating plant should be kept for emergency purposes, the Council taking a full bulk supply from the grid. It was stated, however, that the Electricity Commissioners would not favour any scheme which would immobilise power plant.

Cardiff.—SHELTER SIGNS.—The Emergency Committee is to provide signs for shelters at a cost of £660.

Carlisle.—EXTENSIONS.—The Electricity Committee is to extend buildings at an estimated cost of £17,863.

MAINS IN RURAL AREA.—Mains are to be extended by the Committee in the rural area at a cost of £1,315.

Cheltenham.—FURTHER PRICE REDUCTION.—The Town Council has announced that the lighting flat rate is being reduced from 4d. to 3½d. per kWh. This is the second reduction to be made since the outbreak of war.

Dumfries.—SPECIAL ORDER.—The Electricity Commissioners have made the Dumfries Electricity (Extension) Special Order, 1941 (confirmed by the Board of Trade), in respect of part of the Burgh of Dumfries.

Grimsby.—INCREASE IN HIRE CHARGES.—At a recent meeting of the Electricity Committee it was agreed to increase the charges for the hire of electrical appliances (cookers, wash boilers, immersion heaters, radiators and kettles) by 15 per cent. as from next month. The borough electrical engineer (Mr. S. R. Windle) pointed out that when the price of electricity was raised the increase was not applied to hire charges. The purchase price of cookers had risen by about 60 per cent., spare parts for maintenance by 30 per cent., wiring and installation materials by 30 per cent. and wages by approximately 15 per cent.

Hebburn-on-Tyne.—OVERHEAD LINE. — The Urban District Council has approved plans by the North-Eastern Electric Supply Co., Ltd., for the erection of an overhead line.

London.—ST. PANCRAS.—The Highways Committee has approved a scheme submitted by the chief electrical engineer for converting oil lamps on carriageway obstructions at a cost of £970 to effect a saving of £1,180 per annum.

The Electricity Committee is to extend the mains at a cost of £133.

FULHAM.—Owing to the increased loss of electric irons on hire the Electricity and Lighting Committee recommends that in future consumers wishing to hire irons shall be required to pay a deposit of 10s.

STEPNEY.—The Electricity Supply Committee has purchased 125 secondhand meters at a cost of £112, representing a saving of £331 over the cost of new meters.

Newcastle-under-Lyme.—SHELTER HEATING.—A basic charge of ¾d. per kWh, plus any war increase, for the supply of electricity for heating an air-raid shelter which has been equipped with a new experimental system of warming has been authorised by the Electricity Committee. At a meeting of the Emergency Committee Councillor J. H. Ramsbotham, referring to the proposal to provide electric heating in a number of shelters, said that with the present shortage of electrical equipment it was extremely doubtful if the scheme could be carried out. The Mayor pointed out that the Committee was acting on Government orders in seeking to heat the public shelters in the borough. They must wait and see if the scheme was practicable or not.

North-West Midlands.—SPECIAL ORDER.—The Electricity Commissioners have made a Special Order, confirmed by the Board of Trade, in respect of the acquisition and use of lands by the North-West Midlands Joint Electricity Authority.

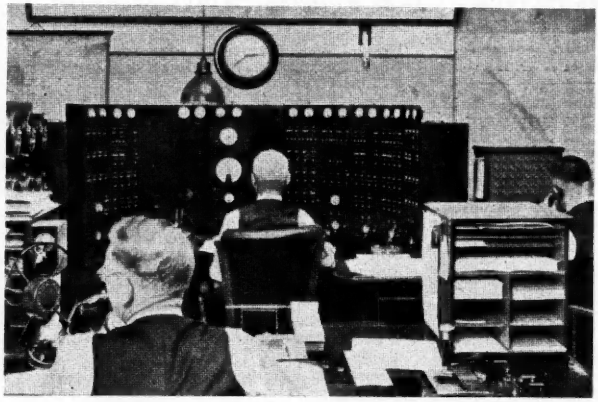
Scarborough. — ELECTRICITY CHARGES. — The Town Council has agreed to take no action at present concerning electricity charges for users of cookers and water heaters. After considering a report by the borough electrical engineer regarding special contract supplies it decided to offer special rates to such consumers if they agreed to restrict their maximum demand between 11 a.m. and 1 p.m. during November, December, January and February. Consumers who do not give this undertaking will be charged at ordinary rates.

LOANS.—The Electricity Committee is seeking sanction to borrow £1,108 for mains and services, £472 for substations and £478 for meters.

Stoke-on-Trent.—OVERHEAD LINE.—The Electricity Committee has obtained consent for the erection of an overhead line to provide supply to Brindley Ford. Sanction has also been received to a loan of £1,950 for the completion of the ring main from Moldenhill to Packmoor.

Sunderland.—PLANT RECONDITIONING.—Subject to the consent of the Central Electricity Board the Corporation is to recondition the Nos. 2 and 3 turbo-alternators at a cost of £14,000. The cost will be borne out of revenue.

Wednesbury.—OBJECTION TO OVERHEAD LINES.—The Council decided at its last meeting to inform the C.E.B. that it viewed with great disfavour the erection of overhead lines on land which was likely to be used as playing fields, and suggested that the possibility of placing the cables underground might be considered.



For expediting tramway repairs, a radio communication system is used at Melbourne.

West Bromwich.—MAINS AND SERVICES.—The Electricity Committee is seeking sanction to a loan of £7,000 for mains and services.

Wolverhampton.—LOWER CHARGES.—It is proposed, as a temporary measure, to withdraw the 7½ per cent. addition made to electricity charges other than to bulk supply consumers in March, 1940. The Electricity Committee recommends that this concession shall take effect from January 1st next, but asks for authority to resume charging the increase if this is considered necessary.

SUPPLY TO WATERWORKS.—The Water Committee is to convert the low-voltage supply to the waterworks to high-voltage at a cost of £1,425.

TRANSPORT

Blackburn.—TRANSPORT UNIFICATION.—The town clerk has been asked to arrange an early meeting of representatives of Blackburn, Darwen and Accrington Corporations to consider the question of implementing a special report prepared by Messrs. Fearnley and Collins (transport consultants) concerning the advisability of establishing a unified transport undertaking for the three boroughs. Copies of the report are to be supplied to Haslingden and Rawtenstall Corporations, whose districts link up with Accrington.

Melbourne (Australia).—TRAMWAY EXTENSIONS.—It is agreeably surprising, at the present time, to receive so soon a copy of the annual report and accounts of the Melbourne and Metropolitan Tramways Board for the year ended June 30th last, and the Board's officers are to be commended for their expeditious completion of an interesting document. The report contains a number of illustrations and graphs showing the progress made. It is apparent that the Board has during the past year faced problems similar to those which have confronted operators in this country, namely, shortage of employees due to enlistments in the Forces, peak-hour difficulties brought about by industrial expansion, curtailment of vehicle supplies, etc. Tramway extensions costing £50,000 were put in hand to meet the needs of war industries; the proposal received the approval of the Governor-in-Council on May 22nd last and by July 6th one route extension was completed. These works made necessary the enlargement of depot facilities at a cost of £14,000 and the erection of a new substation costing £9,000. An interesting event during the year was the conversion to motor-bus operation of the only remaining cable tramways. The Board's vehicles carried 233 million passengers. The manager of the Board is Mr. S. M. Richardson.

Reservation and Deferment

NEW principles are introduced by the revised Schedule of Reserved Occupations published on Monday last (Stationery Office, 1s.). The principal innovation is a system of raising the ages by one year at monthly intervals.

In general, the ages of reservation in so far as they apply to the electrical industry correspond with the "Stage B" ages in the schedule now superseded, or "Stage A" where no "Stage B" is specified. The occupations in which men were de-reserved at Stage B are now omitted.

When a man is to become "de-reserved" he will be notified of the fact and he will pass on the information to his employer who, if he desires to retain the man's services, will have to make application to the district man-power board for the deferment of his calling up. There will be forty-five of these boards each consisting of a chairman, representative of the Ministry of Labour, a labour supply officer, a military recruiting officer and a deferment officer. Where women are concerned there will be a woman representative on the board The boards will have to decide whether the applicant is engaged on work of national importance and if he is irreplaceable by an older or unfit man, or woman.

The calling-up of apprentices in occupations for which the reservation age is 25 or under at December 1st, 1941, will be deferred on application until the completion of their apprenticeship or until they attain the age of 20, whichever is the earlier.

Deferment of the calling-up of de-reserved men cannot be granted after an enlistment notice has been issued. Forms of application for deferment N.S. 300) and a leaflet (N.L.8) explaining the method of making application may be obtained at any local office of the Ministry of Labour and National Service.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

The Perak River Hydro-Electric Power Co., Ltd., held its annual meeting on December 9th when Mr. W. Shearer (chairman), who presided, said that the good results submitted were evidence not only of the conservative financial policy which the board had followed in recent years, but of the wisdom and foresight of his predecessor (Mr. G. Balfour) and his colleagues in undertaking extensions to their plant in Malaya well in advance of the then immediate requirements.

Those extensions had been amply justified and had enabled them to cope adequately with the greatly increased demand from the tin mining industry. The Malayan tin quota had averaged 100 per cent. during the year, as compared with 79 per cent. in the previous year, and as the demand on their system and their output followed almost proportionately the output of tin ore in the area which they served, the supply demanded by their consumers had entailed the full use of the whole of their plant throughout the year.

Although he believed Malaya to be well prepared for all eventualities, shareholders would not, in view of the grave developments in the Far East, expect him to make any forecast as to the probable results of the current year. All that he could say was that for the first quarter of the current financial year profits had been well maintained.

Telephone Properties, Ltd.—In the course of the speech which he is to deliver at the company's adjourned annual meeting on December 23rd Sir Alexander Roger refers to the heavy burden imposed upon the company by the method of grouping it with the Nacional Company (Venezuela) for E.P.T. purposes coupled with the appreciation of the bolivar in comparison with sterling and the Nacional Company's increased revenue above the standard level as a natural result of the building up process in past years.

The directors have decided that the British company would have to shoulder the whole of the burden, put at over £200,000 for 1940 and 1941, and to meet the immediate cash requirements it was found necessary to sell 17 per cent. of the company's holding of ordinary shares in the Nacional Company. The company was now to be assessed separately for E.P.T. as from October 31st, 1941.

The effect of this was shown in the accounts. Even without paying an ordinary dividend the carry forward was reduced from £36,928 to £8,231, and it would not be possible to pay the preference dividend due on January 1st next.

The Nacional Company's business had continued to expand although handicapped by shortage of materials and delays in delivery. Its relations with the Venezuelan authorities continued to be satisfactory.

The General Cable Manufacturing Co., Ltd., reports a profit for the year ended September 30th of £112,279, as compared with £61,007 in the previous year. The liability for taxation, including E.P.T. for the year has been estimated at £85,000 and this sum has accordingly been reserved. After setting aside £2,902 for depreciation, and £837 for directors' and audit fees, the net available balance is £23,539. It is proposed to pay a final ordinary dividend of 9 per cent. (same), maintaining the distribution for the year at 15 per cent., to transfer £7,000 to reserve, and to carry forward £2,801 (against £2,012 brought in).

Ensign Lamps, Ltd.—Speaking at the annual meeting on Friday last, the chairman (Mr. G. W. Fletcher) referred to the satisfactory results achieved during the past year and said that their products were in ever-increasing demand. While during wartime it was not possible to look far ahead, the directors felt that they could face the future with confidence. Mr. Fletcher mentioned that £39,000 had been provided for taxation; this sum should meet their full liability up to the date of the accounts.

Sydney S. Bird & Sons, Ltd.—After referring to the position regarding E.P.T. at the annual meeting on December 11th, the chairman (Sir Ian Stewart-Richardson, Bt.) said that the directors had taken account of this and if the profits were maintained there was no reason why the present rate of dividend should not be continued. The company was well supplied with orders, and the directors were making every effort to strengthen the company's position and to keep in touch with customers with whom normal business had been interrupted by the war.

Marco Refrigerators, Ltd., reports a profit for the year ended September 30th of £9,259, as compared with £15,627 for 1939–40. Tax provision takes £10,000 and the dividend for the year is 2½ per cent. (against 3½ per cent.). The balance carried forward is £9,941 (against £13,307 brought in).

S. Smith & Sons (Motor Accessories), Ltd., have announced a final dividend of 10½ per cent. on the preferred ordinary shares making 17½ per cent. for the year (against 21 per cent.). The dividend on the deferred shares is reduced from 50 to 37½ per cent.

Mann, Egerton & Co., Ltd., report a net profit of £24,821, after meeting taxation, against £23,252 for 1939–40. The ordinary dividend is maintained at 10 per cent., £2,500 is transferred to reserve and £21,973 is carried forward.

Turner & Newall, Ltd., report a fall in the net profit from £667,941 in 1939–40 to £506,472 last year, although there was a 20 per cent. rise in trading profit. The final ordinary dividend is 8¾ per cent. (against 11¼ per cent.), reducing the total for the year from 15 to 12½ per cent.

The Victoria Falls & Transvaal Power Co., is maintaining its interim dividend at 4 per cent.

Belliss & Morcom, Ltd., are paying an interim dividend of 4 per cent. (against 2½ per cent.).

The United River Plate Telephone Co., Ltd., is again paying an interim dividend of 3 per cent.

Tecalemit, Ltd., reports a net profit for the year ended July 31st of £463,591, an increase of £223,475, as compared with the previous year. The ordinary dividend is maintained at 18 per cent.

New Companies

Wallace (Manchester), Ltd.—Private company. Registered December 5th. Capital, £100. Objects: To carry on the business of manufacturers of and dealers in accumulators, dry cell and other batteries, acids and containers, manufacturing chemists, manufacturers of and dealers in wireless and television sets, electrical fittings and apparatus, electricians, etc. Annie E. Warshawsky, 81, Bellott Street, Manchester, is the first director. Registered office: 11, Albert Square, Manchester, 2.

Electronic Applications, Ltd.—Private company. Registered December 3rd. £100. Objects: To carry on the business of designers, inventors, consultants for engineering inventions and industrial devices, manufacturers of and dealers in scientific instruments, electrical apparatus, dynamos, motors, tools, magnetos and accessories, radio engineers, etc. J. W. McLeod, Trevone, Burnside Crescent, Chelmsford, is the first director. Registered office: 446, Salisbury House, E.C.2.

Durable Engineering Co., Ltd.—Private company. Registered December 1st. Capital, £250. Objects: To carry on the business of electrical, mechanical and general consulting engineers, engineering and general agents, manufacturers of and dealers in electric motors and dynamos, haulage and lifting machinery, vehicles, cycles, etc. Permanent directors: J. N. Holmes, 18, Birchmead Avenue, Pinner, Middlesex; and B. A. Forrest, 33, Grove Crescent, The Hyde, Kingsbury, N.W.9.

Companies' Returns

Statements of Capital

China & Japan Telephone & Electric Co., Ltd.—Capital, £200,000 in £1 shares. Return dated July 16th. 150,000 shares taken up. £60,239 paid. £89,761 considered as paid. Mortgages and charges: Nil.

Europe & Azores Telegraph Co., Ltd.—Capital, £200,000 in 20,000 shares of £10 each. Return dated July 11th. All shares taken up. £144,320 paid. £55,680 considered as paid. Mortgages and charges: Nil.

Exe Valley Electricity Co., Ltd.—Capital, £225,000 in 225,000 shares of £1 each. Return dated July 10th. 215,000 shares taken up. £209,700 paid. £5,300 considered as paid. Mortgages and charges: Nil.

Teignmouth Electric Lighting Co., Ltd.—Capital, £80,000 in 80,000 ordinary shares of £1 each. Return dated July 10th. All shares taken up. £69,500 paid. £10,500 considered as paid. Mortgages and charges: Nil.

Llangollen & District Electric Light & Power Co., Ltd.—Capital, £6,000 in 3,500 ordinary and 2,500 preference shares of £1. Return dated June 11th. 360 preference and 1,753 ordinary shares issued and fully paid up. Mortgages and charges: £1,500.

Murphy Radio, Ltd.—Capital, £150,000 in 144,000 ordinary shares of £1 and 120,000 "A" ordinary shares of 1s. Return dated June 23rd. 98,838 £1 ordinary and 68,264 "A" ordinary shares taken up. £42,736 11s. paid. £59,514 13s. considered as paid. Mortgages and charges: £81,472.

Standard Telephones & Cables, Ltd.—Capital, £2,500,000 in £1 shares. Return dated June 13th. All shares taken up. £906,000 paid. £1,594,000 considered as paid. Mortgages and charges: Nil.

W. H. A. Robertson & Co., Ltd.—Capital, £36,000 in 600 ordinary and 3,000 preference shares of £10. Return dated July 18th. 600 ordinary and 2,180 preference shares taken up. £25,650 paid (£5 on 430 preference and £10 on 1,750 preference and 600 ordinary). Mortgages and charges: Nil.

Lisbon Electric Tramways, Ltd.—Capital, £1,500,000 in 1,000,000 ordinary and 500,000 preference shares of £1 each. Return dated July 9th. 949,757 ordinary and 425,553 preference shares taken up. £134,026 paid. £1,241,284 considered as paid. Mortgages and charges: £212,100.

Mortgages and Charges

Thornton Products, Ltd.—Mortgage dated April 14th, 1938, charged on land, factory, etc., at Thornton, Bradford (being property acquired by the company on April 18th, 1941). Amount owing: £725,616 6s. (Registered pursuant to Section 81 of the Companies Act, 1929). Holders: Halifax Building Society.

Truvox Engineering Co., Ltd.—Particulars filed of £30,000 debentures, authorised November 13th, 1941, charged on the company's undertaking and property, present and future, including uncalled capital, the whole amount being now issued.

Satisfaction in full on November 20th, 1941, of debenture authorised June 16th, 1941, and registered July 10th, 1941, securing all moneys due or to become due from the company to Westminster Bank, Ltd.

F. Bradley, Ltd.—Satisfaction in full on November 6th, 1941, of debenture dated June 11th, 1940, and registered July 1st, 1940, securing £676 8s. 7d.

P. H. British Electrical Works, Ltd.—Satisfaction in full on November 3rd, 1941, of charge in favour of Westminster Bank, Ltd., registered April 22nd, 1932, securing all moneys accruing to the bank.

Receivers Appointed and Released

Instanta Electric, Ltd.—(A) H. J. Townsend, 166, Streatham Hill, S.W.2, ceased to act as receiver and manager on November 28th, 1941. (B) On same date W. B. Holden, 3, Abchurch Yard, E.C., was appointed to the same capacities under powers contained in debentures dated June 30th, 1939, and August 4th, 1939.

Evrizone Radio & Television Co., Ltd.—P. Wickenden, 12, Lonsdale Gardens, Tunbridge Wells, Kent, was appointed receiver on September 6th, 1941, under powers contained in two debentures, both dated September 7th, 1938. (Notice filed December 4th, 1941.).

T. W. Ashworth, Ltd.—P. W. Ardran, 14, Chapel Street, Liverpool, 3, ceased to act as receiver and/or manager on December 2nd, 1941.

Liquidation

Wilkes Radio (Urmston), Ltd.—Particulars of claims by January 31st to the liquidator, Mr. C. Green, 46, Singleton Road, Kersal, Salford, 7.

STOCKS AND SHARES

TUESDAY EVENING.

STOCK EXCHANGE markets, after being seriously depressed by news of the sinking of H.M.S. *Prince of Wales* and *Repulse*, rallied to some extent on news of American successes in the Pacific, together with hopeful statements concerning the Libyan and the Russian battlefronts. The first effects of the depression extended to most parts of the Stock Exchange; the prices of very few active stocks managed to resist a general tendency caused partly by sentiment, partly by a fair amount of selling by nervous holders. Japanese bonds and stocks were again marked down. Tokyo sixes, for instance, are now quoted about 14½, a further fall of 5½ points on top of the 11½ recorded last week. It is taken for granted that the company will not pay interest on the bonds during the period of hostilities. (For this reason, the yield on the bonds has been removed from our price lists.) Reflection of the Japanese crisis is shown in a fall of 7s. 6d. in Oriental Telephone shares, which have relapsed to 70s. A sharp drop in Cable and Wireless ordinary stock is attributable to the same cause.

Changes in Prices

Apart from the movements in prices mentioned above, Victoria Falls ordinary have gone back to 80s.; the interim dividend of 3 per cent. is the same as that of a year ago. The company's preference are $\frac{1}{16}$ lower at 36s. 3d. Indian stocks and shares have weakened owing to the threat to Burma and the Burma Road. Calcutta Electrics at 38s. are 1s. easier. Australian and Canadian issues have also gone back to a moderate extent in the general easing of prices. Atlas Electrics lost a few pence at 3s. 9d. The only quotable change in the group of Home electricity supply companies is a rise of 6d. in West Gloucester ordinary, raising the price to its par value of 20s. British Electric Traction deferred at 905 is 25 points lower. Railway stocks, after showing pronounced weakness, recovered to some extent. Southern Railway 5 per cent. preferred at 63½ is no more than a point lower on the week.

Miscellaneous Movements

Ever Ready shares at 30s. show a slight fall and Murex at 90s. are 3s. 9d. down, the reason in the latter case being a mild pressure to sell shares in a market unwilling to take them. S. Smith & Sons 1s. deferred shares are unchanged at 7s. 6d., although the dividend is cut from 50 to 37½ per cent. Shares in companies connected with the heavy industries have followed the general trend, Vickers being 9d. lower at 17s. 3d., Babcock & Wilcox 6d. down at 44s. 6d. An outstanding exception is a rise of 2s. 6d. in Falk Stadelmann, which raised the price to 22s. 6d. The high yield has apparently, if somewhat tardily, attracted buyers. The gilt-edged list, in spite of dullness amongst British Government securities, holds its prices well on the whole. Central Electricity 3½ per cent. stock of 1974/94 at 97 is up 10s. A loss of similar extent lowered London Electric Transport 2½ per cent. stock to 96½.

Cable Stocks Weaken

Reference has been made in the opening paragraph to the fall in Cable and Wireless ordinary, the price having given way 4½ points to 66½. The 5½ per cent. preference stock is down 1½. This brought about falls in Globe Telegraph & Trust ordinary to 30s. and in the preference to 28s. 9d., declines of $\frac{1}{16}$ in each case. Anglo-American Telegraph preferred and deferred stocks are both 1 down. There has been a little activity in Anglo-Portuguese Telephones; the price is left unchanged at 16s. 3d.

Sound Ordinary Shares

Associated Electrical Industries ordinary shares have come on offer, as to a thousand or two shares, at 44s. For several years past the company has paid an annual dividend in April of 10 per cent., and at the present price the return is £4 11s. per cent. on the money. It is, of course, somewhat unusual to find present-day companies, paying their dividends only once a year. The General Electric, which is one of them, has frequently been urged to divide payments into half-yearly amounts, but so far the directors have declined to accede to the proposal. Thomas Tilling has been paying, for some time past, 10 per cent. per annum, and the shares are on offer at 47s. 6d. at which, on the basis of the 10 per cent. dividend, payable in September and March, the return is £4 4s. 6d, per cent.

Cromptons and Others

Crompton Parkinson 5s. "A" ordinary shares at 22s., and Reyrolle £1 ordinary shares at 57s., give yields of 4½ and 4⅛ per cent. respectively, assuming maintenance of the previous dividends. Crompton Parkinson have recently declared the final dividend making, as before, 20 per cent. for the full year. Shares in which there is a small market, and of which a thousand or two can be obtained at the present time, are those of the Provincial Traction Company. The nominal value is 4s., and they are offered at 4s. 6d., ex the recently-paid dividend. For some years, the company paid 6 per cent. per annum, but raised this to 7 per cent. in respect of the year which ended March 31st last. The return at the price mentioned is 6¼ per cent.

The price of Electric & Musical Industries hares fell $\frac{1}{16}$ to 13s. 9d., in company with most of the popular industrials, although, logically,

(*Concluded on page* 719)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Dec. 16	Rise or Fall	Yield £ s. d.
Home Electricity Companies					
Bournemouth and Poole	15	12½	53/9	..	4 12 9
British Power and Light	7	6	26/6	..	4 10 7
City of London	7½	7	25/9	..	5 8 9
Clyde Valley	8	8	37/6	..	4 5 4
County of London	10½	8	35/–	..	4 11 5
Edmundson's:					
7% Pref.	7	7	32/6	..	4 6 2
Ord.	6	6	28/–	..	4 5 9
Elec. Dis. Yorkshire	9	9	42/–	..	4 5 9
Elec. Fin. and Securities	12½	12½	43/9	..	5 14 2
Elec. Supply Corporation	11½	10	43/9	..	4 11 4
Isle of Thanet	2	Nil	9/–	..	—
Lancs Light and Power	7½	7½	33/9	..	4 9 0
Llanelly Elec.	5½	5½	22/–	..	5 0 0
Lond. Assoc. Electric	5½	4½	19/6	..	4 12 4
London Electric	7	7	24/6	..	5 14 3
London Power Deb. Red.	5	5	104	..	4 16 2
Metropolitan	10	8	36/3	..	4 8 5
Midland Counties	8	8	37/6	..	4 5 4
Mid. Elec. Power	9	9	39/6	..	4 11 2
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec.:					
Ordinary	7	7	29/6	..	4 15 0
7% Pref.	7	7	32/6	..	4 6 2
Northampton	10	10	44/6	..	4 10 0
Notting Hill 6% Pref. (£10)	6	6	8½	..	—
Northmet Power:					
Ordinary	10	7	35/–	..	4 0 0
6% Pref.	6	6	30/–	..	4 0 0
Richmond Elec.	6	6	22/6	..	5 6 8
Scottish Power	8	8	38/9	..	4 2 9
Southern Areas	5	5	18/3	..	5 9 7
South London	7	7	23/6	..	5 19 2
West Devon	5	5	21/3	..	4 14 1
West Glos.	4½	4½	20/–	+6d.	4 10 0
Yorkshire Elec.	8	8	39/6	..	4 1 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	3/9	–3d.	—
Calcutta Elec.	8*	7*	38/–	–1/–	—
Cawnpore Elec.	10	10	30/–	..	6 13 4
East African Power	7	7	27/–	..	5 3 8
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/–)	7½	7½	12/–	–1/–	6 5 0
Madras Elec.	6*	4*	22/6	..	3 11 1
Montreal Power	1½	1½	24½	–1	6 2 5
Palestine Elec. "A"	Nil	Nil	20/9	..	—
Perak Hydro-elec.	6	7	15/–	–3/9	9 6 8
Shawinigan Power	83cts.	90cts.	15	..	—
Tokyo Elec. 6%	6	6	14½	–5½	—
Victoria Falls Power	15	15	80/–	–★	3 15 0
Whitehall Inv. Pref.	7½	7½	15/–	..	10 0 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price Dec. 16	Rise or Fall	Yield £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110	..	4 11 1
1955–75	5	5	114	..	4 7 9
1951–73	4½	4½	106½	..	4 4 6
1963–93	3½	3½	101	..	3 9 4
1974–94	3¼	3¼	97	+½	3 7 0
London Elec. Trans. Ltd.	2½	2½	96⅝	–½	2 11 10
London & Home Counties 1955–75	4½	4½	110	..	4 1 10
Lond. Pass. Trans.:					
A	4½	4½	116½	..	3 17 3
B	5	5	114½	..	4 7 4
C	1½	3	41	..	7 6 4
West Midlands J.E.A. 1948–68	5	5	109½	..	4 11 4
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	105½	–1	5 13 9
Def.	1½	1½	23½	–1	6 7 8
Anglo-Portuguese	8	8	16/3	..	9 17 0
Cable & Wireless:					
5½% Pref.	5½	5½	103½	–1½	5 6 4
Ord.	4	4	66½	–4½	6 0 4
Canadian Marconi $1	Nil	4cts.	6/–	–6d.	2 12 0
Globe Tel. & Tel.:					
Ord.	8½*	8½*	30/–	–★	—
Pref.	6	6	28/9	–★	4 3 4
Great Northern Tel.: (£10)	20	20	14½	..	—
Inter. Tel. & Tel.	Nil	Nil	3	..	—
Marconi-Marine	7½	7½	28/9	..	5 4 4
Oriental Tel. Ord.	11½*	16	70/–	–¾	4 11 6
Telephone Props.	6	6	10/–	..	12 0 0
Tele. Rentals (5/–)	10	10	8/9	..	5 14 3
Traction and Transport					
Anglo. Arg. Trams:					
First Pref. (£5)	Nil	Nil	2/6	..	—
4% Inc.	Nil	Nil	6½	..	—
Brit. Elec. Traction:					
Def. Ord.	45	45	905	–25	5 0 0
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8*	8	43/9	..	3 13 1
Brazil Traction	$1	50c.	11½	–½	—
Calcutta Trams	8	5½	22/6	..	4 17 9
Cape Elec. Trams	5	5	20/–	..	5 0 0
Lancs Transport	10	10	42/6	..	4 14 1
Mexican Light:					
1st Bonds	5	5	75	..	6 13 4
Rio 5% Bonds	5	5	92½	..	5 8 3
Southern Rly.:					
5% Prefd.	5	5	63½	–1	7 17 6
5% Pref.	5	5	105½	..	4 14 9
T. Tilling	10	10	47/6	..	4 4 2
Tilling & B.A.	8*	7*	52/6	..	2 13 4
West Riding	10	10	39/6	..	5 1 3

(*Continued on next page*)

* Dividends are paid free of Income Tax.

Company	Dividend 1939-40	Dividend 1940-41	Middle Price Dec. 16	Rise or Fall	Yield p.c.
Equipment and Manufacturing					
					£ s. d.
Aron Elec. Ord. ..	Nil	7½	23/–	..	6 10 4
Assoc. Elec.:					
Ord.	10	10	43/9	..	4 16 3
Pref.	8	8	38/9	..	4 2 4
Automatic Tel. & El.	12½	12½	50/–	..	5 0 0
Babcock & Wilcox	11	11	44/6	–6d.	4 18 9
British Aluminium	12½	10	45/9	..	4 7 4
British Insul. Ord.	20	20	90/–	..	4 9 0
British Thermostat (5/–)	18½	18½	13/9	..	6 14 6
British Vac. Cleaner (5/–)	12½	10	12/6	..	4 0 0
Brush Ord. ..	Nil	Nil	4/6	..	—
Callender's ..	15	15	73/9	..	4 1 4
Chloride Elec. Storage	15	15	71/3	..	4 4 3
Consolidated Signal	17	17	80/–	..	4 5 0
Crabtree (10/–) ..	17½	17½	28/3	..	6 4 0
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 8 6
E. K. Cole (5/–) ..	10	Nil	9/–	..	—
E.M.I. (10/–) ..	Nil	6	13/9	–½	4 7 3
Electric Construction	10½	10	34/6	..	5 16 0
Enfield Cable Ord.	16½	12½	53/9	..	4 13 0
Elecl. Switchgear (10/–)	16	10	20/–	..	5 0 0
English Electric ..	10	10	37/6	..	5 6 8
Ensign Lamps (5/–)	25	25	15/–	..	8 6 8
Ericsson Tel. (5/–) ..	25*	22*	40/–	..	2 15 0
Ever Ready (5/–) ..	40	40	30/–	–6d.	6 13 4
Falk Stadelmann ..	7	7½	22/–	+½	6 16 4
Ferranti Pref. ..	7	7	26/3	..	5 6 10
G.E.C.:					
Pref.	6½	6½	32/6	..	4 0 0
Ord.	20	17½	78/9	..	4 8 10
Greenwood & Batley	15	13	25/9	..	10 2 0
Hall Telephone(10/–)	15	10	15/7½	..	6 8 0
Henley's (5/–) ..	20	20	22/6	..	4 9 1
4½% Pref. ..	4½	4½	21/3	..	4 4 8
Hopkinsons ..	15	15	45/–	..	6 13 4
India-Rubber Pref.	5½	5½	21/3	..	5 3 6
Intl. Combustion ..	32½	30	105/–	..	5 14 3
J. Lucas	15	15	36/3	..	4 10 8
Johnson & Phillips	15	15	55/–	..	5 9 1
Lancashire Dynamo	20	20	65/–	..	6 3 1
Laurence, Scott(5/–)	15	15	11/–	..	6 16 4
London Elec. Wire	7½	7½	25/–	..	6 0 0
Mather & Platt ..	13½	10	41/3	..	4 14 1
Metropolitan Elec. Cable Pref. ..	5½	5½	21/3	..	5 3 6
Murex	20	20	90/–	–½	4 9 0
Pye Deferred (5/–)	25	25	13/9	..	9 1 10
Revo (10/–) ..	5	20	25/7½	..	7 16 0
Reyrolle	12½	12½	56/3	..	4 9 0
Siemens Ord. ..	7½	7½	25/–	..	6 0 0
Strand Elec. (5/–) ..	2	4	3/6	..	5 14 4
S. Smith (1/–) ..	50	37½	7/6	..	5 0 0
Switchgear & Cowans (5/–) ..	10	15	10/–	..	7 10 0
Tel. Condenser(10/–)	Nil	5	11/3	..	4 9 0
T.C. & M.	10	10	41/3	..	4 17 0
Telephone Mfg.(5/–)	9	9	8/3	..	5 9 1
Tube Investments..	23¾	20	87/–	–6d.	4 12 0
Vactric (5/–) ..	4	Nil	3/6	..	—
Vickers (10/–) ..	10	10	17/3	–9d.	5 16 1
Ward & Goldstone (5/–)	20	20	16/6xd	..	6 1 3
Westinghouse Brake	17½	10	51/3	..	3 18 2
Walsall Conduits(4/–)	55	55	33/6	..	6 15 4
West, Allen (5/–) ..	7½	7½	5/–	..	7 10 0

* Dividends are paid free of Income Tax.

Stocks and Shares (*Concluded from page* 717)

the declaration of war by Japan has no more than a very indirect bearing upon the E.M.I. company. The report which appeared last week showed an expansion in the turnover. The company has practically doubled its cash and investments item, which now stands a little over half-a-million pounds, against £252,600 of cash and investments this time last year. Business in the shares of the radio industry became subdued on political developments, and Cossor, which had been up to a little over 9s., reacted to 8s. 9d. E. K. Cole are unchanged at 9s.

Perak Hydro-Electric

The Japanese war news led to a fall in Perak-River Hydro-Electric £1 ordinary shares to 15s., in consequence, of course, of the threat to the area in which the company operates. The company's year ends with July, and for 1940/41 the dividend was 7 per cent., comparing with 6 per cent. in the previous year, and 2½ per cent. in 1938/9. This is another of the companies which pays its dividends once a year, in December, the present price being ex the distribution just made. On a 7 per cent. dividend basis, the shares at 15s. will give a yield of 9⅓ per cent.

The threat to United States and Canada brought in a few sellers of British Columbia Power "A" shares, which are of no par value. They were offered at 32, cum the quarterly dividend, making 2 per cent. for the year.

Tube Investments

The surprise cut recently made in the dividend on Tube Investments is fully explained in the report. As might have been supposed, insurance, higher taxation and increased production costs, combined to reduce the profits of the company's subsidiaries. The output from the works showed an increase and had not the directors considered it necessary to build up a strong reserve position, the regular dividend of 23¾ per cent. could have been continued. The directors decided to allocate £200,000 as a special fund against wartime contingencies, and it is because of this that the dividend was reduced by 3¾ per cent. The report justifies the expectation that the company, during the current year, will handle a large volume of business, but it seems hardly likely that the dividend of 23¾ per cent. will be reinstated during the war.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

20812. "Electrical plug and socket connectors." J. H. Tucker & Co., Ltd., F. C. Fuke and J. B. Tucker. July 18th, 1939. (Addition to 460731.) (541325.)

1940

2902. "Hermetic sealing of metal into vitreous materials." Siemens Electric Lamps & Supplies, Ltd., J. N. Aldington and A. J. Meadow-Croft. February 15th, 1940. (541208.)

5873. "Electric insulators." A. Reyrolle & Co., Ltd., H. M. Gale, and I. W. A. Kirkwood. April 1st, 1940. (541329.)

6609. "Electrical time delay means." G. S. P. Freeman. April 12th, 1940. (541301.)

6697. "Radioactive alloys, and methods of preparing the same." Firestone Tyre & Rubber Co. June 4th, 1940. (541302.)

6763. "AC electric circuit-breakers having arc control devices." A. Reyrolle & Co., Ltd., and D. F. Amer. April 15th, 1940. (541235.)

6775/6785. "AC electric circuit-breakers of the gas-blast type." A. Reyrolle & Co., Ltd., and D. F. Amer. April 15th, 1940. (541236/541237.)

7005. "Dynamo-electric machines." British Thomson-Houston Co., Ltd., and A. C. Lane. April 18th, 1940. (541303.)

7080/7081. "Apparatus for the electrical treatment of colloidal dispersions." Dunlop Rubber Co., Ltd., E. A. Murphy, F. J. Paton and J. Ansell. April 19th, 1940. (541304/541305.)

7114. "Holders for thermionic valves and like electrical connecting devices." G. W. Clark and H. G. A. Kay. April 19th, 1940. (541306.)

8691. "Coating of ferrous metals." British Thomson-Houston Co., Ltd. May 16th, 1939. (541240.)

8785. "Electrodes for electricity storage batteries." J. Lucas, Ltd., and H. E. Clarke. May 16th, 1940. (541245.)

8799. "Electric heaters for use in the treatment of hair." Eugene, Ltd., and V. Schulz. May 17th, 1940. (Cognate application, 11157/40.) (541247.)

8842. "Arrangements for transmitting power to intermediate repeater stations in carrier-wave signalling systems." Standard Telephones & Cables, Ltd., and F. Ralph. May 17th, 1940. (541248.)

8937. "Suction cleaners." Hoover, Ltd. July 8th, 1939. (541309.)

8949. "Thermally operated electric control or relay devices." British Thomson-Houston Co., Ltd. May 19th, 1939. (541340.)

9306. "High-frequency apparatus." British Thomson-Houston Co., Ltd. May 27th, 1939. (541271.)

9367. "Electrical terminal arrangements." Marconi's Wireless Telegraph Co., Ltd., and J. W. Graham. May 28th, 1940. (541250.)

9370. "Thermionic valve circuit arrangements." Marconi's Wireless Telegraph Co., Ltd., and C. C. Whitehead. May 28th, 1940. (541272.)

9626. "Methods of automatically controlling the transmission characteristics in electric wave transmission systems." Standard Telephones & Cables, Ltd. June 3rd, 1939. (541251.)

9908. "Electrolytic methods of oxidising the surface of nickel or nickel alloys." A. R. Jahn, C. Jahn and H. F. Lancaster. June 6th, 1940. (541347.)

10206. "Electronic amplifying circuits." Scophony, Ltd., and S. H. M. Dodington. June 12th, 1940. (541276.)

11630. "Electrically conductive devices, and methods of making the same." Standard Telephones & Cables, Ltd. July 13th, 1939. (541222.)

12001. "Negative feedback amplifiers." Standard Telephones & Cables, Ltd. October 17th, 1939. (541260.)

12209. "High-tension current distributor for electric ignition apparatus of internal-combustion engines." Scintilla, Ltd. July 17th, 1939. (541262.)

12555. "Sand-blast and like cleaning apparatus." Broom & Wade, Ltd., and E. Elwess. August 3rd, 1940. (541312.)

13189. "Electric switches having knuckling contacts." General Electric Co., Ltd., C. J. O. Garrard and H. Randall. August 19th, 1940. (Cognate application, 3621/41.) (541281.)

13684. "Sealing glands for electric cables." English Electric Co., Ltd., and M. A. B. Landers. August 31st, 1940. (541285.)

18047. "Control systems for fluid-pressure-operated circuit-breakers." British Thomson-Houston Co., Ltd. December 22nd, 1939. (541321.)

1941

41. "Electric tumbler switches." J. H. Tucker & Co., Ltd., and F. C. Fuke. January 1st, 1941. (541264.)

76. "Manufacture of magnetic cores." Standard Telephones & Cables, Ltd. January 6th, 1940. (541322.)

1799. "Electrolysis of alkali chlorides." M. C. Taylor and W. C. Gardiner. February 10th, 1941. (541292.)

2128. "Bearings." Mallory Metallurgical Products, Ltd. August 22nd, 1940. (541228.)

14274. "Air compressors." Browett Lindley (1931), Ltd. February 9th, 1940. (Divided out of 541174.) (541295.)

The B.B.C. at War

NO institution is more critically discussed by the public in this country than the B.B.C., and much of this criticism is due to ignorance of the problems which the Corporation has to overcome. With the outbreak of war the B.B.C. had to reorganise its system completely to meet the changed conditions and all eventualities.

Despite the air raids of last winter, in which Broadcasting House, London, and Regional B.B.C. centres were hit, an uninterrupted service was maintained. How this was done, the complex problems which the Corporation has successfully overcome and how it has built up its programmes to meet the demands of the Home Front and of the Forces is graphically told in "B.B.C. at War," which is now on sale (price 6d.).

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Australia. — SYDNEY COUNTY COUNCIL. — January 29th. Steam and feed water piping for No. 10 turbo-alternator for the Bunnerong power station. Specification 559.

Birmingham.—January 14th. Salvage Department. Lead-plate batteries for electric refuse collection vehicles. (See this issue.)

Middlesbrough.—December 29th. Town Council. Electrical installations in trenches and installation of electric pumps. P. Kitchen, town clerk, Municipal Buildings.

South Africa.—DURBAN.—January 16th, 1942. City Council. Potential and current transformers. Contract E.2038.

JOHANNESBURG.—December 27th. City Council. Low-voltage metal-clad switchboards. Contract 883. Oil-immersed circuit-breakers. Contract 884.

Southport.—January 3rd. Corporation. Maintenance of two electric lifts at the new police headquarters. (December 12th.)

Orders Placed

Australia.—VICTORIA.—State Electricity Commission. Electric-discharge lamps (Spec. 40–41/101).—British General Electric Pty., Ltd., Wm. Adams & Co., Ltd., Condor Lamps (A'sia) Pty., Ltd.

COMMONWEALTH.—Postmaster-General's Department. Accumulator plates and separators (Sch. C. 3242); Con. 4,553 (£879).—Tudor Accumulator Co., Ltd. Con. 4,554 (£2,394).—Exide Batteries of Aust. Pty., Ltd.

Department of the Interior.—Overhead busbar system and plug-in fuse units, N.S.W. (£4,824).—British General Electric Co. Pty., Ltd. Cable (£294).—W. T. Henley's Telegraph Works Co., Ltd. Busbar distribution and power outlet boxes (£736).—Siemens (Aust.) Pty., Ltd. Reflectors (£235).—Siemens (Aust.) Pty., Ltd. Line taps (£217).—W. T. Henley's Telegraph Works Co., Ltd. Water tube boiler, N.S.W. (£4,386).—Babcock & Wilcox, Ltd.

Stores Supply and Tender Board. Electric light globes, period October 1st, 1941, to September 30th, 1942 (Sch. C.T.B. 242): Con. 2,896.—British General Electric Co. Pty., Ltd. Con. 2,897.—Siemens (Aust.) Pty., Ltd.

Department of Public Works. Storage cabinet and refrigeration bath, for Public Health Department (£171).—British General Electric Co. Pty., Ltd.

Department of Supply and Development. Boiler installations, Sch. 41,491 (£9,990).—John Thompson (Aust.) Pty., Ltd. Underground cable (£420).—Johnson & Phillips, Ltd.

Carlisle.—Electricity Committee. Accepted. Switchgear (£19,666).—British Thomson-Houston Co., Ltd.

India. — Government Stores Department. Accepted. Cables (Rs. 12,100) and battery accessories (Rs. 32,312).—Callender's Cable & Construction Co., Ltd. 95 miles of copper conductor (Rs. 35,252).—W. T. Henley's Telegraph Works Co., Ltd. Cables and joint boxes (Rs. 11,030).—Siemens Bros. & Co., Ltd. 825 miles of bronze wire (Rs. 26,709).—British Insulated Cables, Ltd. Battery accessories (Rs. 56,775).—General Electric Co., Ltd.

London. — FULHAM. — Works and Highways Committee. Recommended. Installation of traffic light signals in connection with new arterial road and maintenance for one year (£829).—Automatic Telephone & Electric Co.

STEPNEY.—Borough Council. It is recommended that the existing contracts for the supply of coal and cables shall be continued for a further twelve months to March 31st, 1943. Recommended. Fault locating equipment (£69).—Cambridge Instrument Co.

ST. PANCRAS.—Contracts Committee. Accepted. Ventilating plant for power station (£231).—Sturtevant Engineering Co., Ltd.

Stretford.—Emergency Committee. Accepted. Installation of electric lighting and heating at shelters (£2,474).—G. N. Bailey & Co., Ltd. (in lieu of default tender).

Sunderland.—Corporation. Accepted. New trackwork for the renewal of the High Street tramway junction (£475).—Titan Trackwork Co., Ltd.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Airdrie.—British Restaurant and wartime nursery; borough surveyor, Royal Buildings, Graham Street.

Amersham.—Hospital; county architect, County Offices, Aylesbury.

Amesbury.—Extension of water pumping station for R.D.C.; C. Laidman, surveyor, Council offices.

Banbury.—Canteen and extensions; Switchgear & Equipment, Ltd.

Bangor.—Church, Maesgeirchon estate; G. Wynne Griffith, Presbyterian Church, Bangor.

Barking.—Canteen, Hertford Road; R. F. Read & Co., Ltd.

Additions; Nil Secundum Smelting Works and Allied Products, Ltd.

Laboratory additions; Thames Plywood Manufacturers, Ltd.

Canteen and store; J. G. Austin (Ilford), Ltd.

Bedlington (Northumberland).—Canteen, Bedlington School; W. W. Tasker, county architect, Mitford Road, Morpeth.

Birmingham.—Canteens at 28 schools; H. J. Manzoni, city engineer, The Council House.

Bootle.—Conversion of Welsh Chapel, Peel Street for restaurant; borough engineer.

Rest centres; borough engineer.

Brentwood.—Emergency feeding centres at Brentwood, Great Warley, Shenfield and Hutton for U.D.C.; D. A. Dallas, surveyor, Ingrave Road, Brentwood, Essex.

Broughton.—Machine shop at works; A. Cassel & Sons, Ltd., builders, Hilton Street, Broughton, Manchester, 7.

Buckfastleigh.—Fire station; surveyor, Urban District Council Offices, Buckfastleigh, Devon.

Bury.—Cooking depot and feeding centres; J. Chadwick, borough engineer, Bank Street.

Cardiff.—Restaurants (£6,600); city engineer.
Disinfecting station, West Ward (£2,950); city engineer.

Carlisle.—Warehouse, Metcalfe Street, for C. Allan; J. Slack, architect.
Flour store, Elm Terrace; S. L. Jack, architect.

Dartford.—Depot, East Hill (£1,115); borough engineer.

Derbyshire. — Rebuilding Newton Council School, Blackwell; J. Harrison, county architect, St. Mary's Gate, Derby.

Esher.—British Restaurants at East Molesey, Long Ditton and West Molesey for U.D.C.; surveyor, Council Offices, 1, High Street, Esher, Surrey.

Fleet.—Additions to premises, Albert Street; County Commercial Cars, Ltd.

Glasgow.—Restaurants; city engineer.
Gymnasium, Notre Dame High School (£2,362); convent authorities.
Additions, 1,253, Shettleston Road; A. & D. Turner, Ltd.
Alterations, 41–51, Port Dundas Road; Watson's Typewriters, Ltd.
Sleeping quarters, Gt. Western Road; Barr & Stroud, Ltd.
Reconstruction, 100, Logan Street; W. M'Lachlan & Co., Ltd.
Canteen, Blochairn Steel Works; Steel Co. of Scotland.
Canteen, Yoker power station; Clyde Valley Electric Power Co.

Havant.—British Restaurant at Park Way for Havant and Waterloo U.D.C.; Engineer's Department, 1, Park Road, Havant.

Hexham-on-Tyne.—Canteen at Grammar School (£600); M. Hogarth & Sons, Princes Street, Corbridge-on-Tyne.

Hinckley.—Additions, Barwell; Harvey, Harvey & Co., De Montfort Works, Barwell.

Jarrow-on-Tyne.—Canteen at Mercantile Dry Dock works; C. A. James, managing director.

Kettering.—Additions to Laurel Road; Greenlees & Sons (Easiphit), Ltd.

London.—LEWISHAM.—Offices, stores and workshops, Ravensbourne Avenue; A. Hargreaves.

Malvern.—British Restaurants at Malvern Link and Great Malvern for U.D.C.; C. C. Judson, surveyor, The Council House.

Manchester.—Equipment of Civil Nursing Reserve quarters, Withington Hospital (£1,600); G. N. Hill, city architect, Town Hall.
Re-building brewery; R. G. Ryman, architect, Hillcrest, Carshalton Beeches, Surrey.

Middlesbrough.—Buildings at the pumping station for Tees Valley Water Board; T. S. Winter, engineer, Water Board offices, Corporation Road, Middlesbrough.

Mirfield.—Canteen; Cotton Spinning Co., Ltd., Britannia Mills.

Newcastle-on-Tyne.—Rebuilding garage, Northumberland Road for Hoults, Ltd.; Marshall, Tweedy and Bourn, architects, Grainger House, Blackett Street, Newcastle.
Joiners' shop and boilerhouse, Walker Road for G. Angus & Co.; Hetherington & Wilson, architects, County Chambers, Westgate Road, Newcastle.

Newton Heath.—Licensed premises, Scotland Hall Lane and Briscoe Lane; R. S. Litherland, architect, 10, High Street, Burton-on-Trent.

Northenden.—Factory; G. Westcott & Son, architects, 31, Byrom Street, Manchester.

Openshaw.—Canteen; Hugon & Co., Ltd., Ogden Lane.

Rugby.—Extensions to canteen kitchen; Bluemel Bros., Ltd., Wolston.

Salford.—Alterations to fire station, with electrical work, and to hospital laboratory; W. A. Walker, borough engineer.

Stretford.—Electrical work at air-raid shelters; N. G. Bailey & Co., Ltd., 196, Deansgate, Manchester.
Canteen, etc., Barton Dock Road; Ford Motor Co., Ltd.

Swindon.—Dwellings, Moredon Road; T. P. Bennett & Son, architects.

Teddington.—Additions, Luther Road; W. Alexander.
Dispatch and repair rooms, Film Studios, Broom Road; Warner Bros., First National Productions, Ltd.

Tonbridge. — Adapting Railway Hotel hall, Paddock Wood, as British Restaurant for Tonbridge R.D.C.; surveyor, Council Offices, 48, Pembury Road, Tonbridge, Kent.

Torquay.—Alterations, Electric Theatre, Temperance Street for Torquay Entertainments, Ltd. W. E. Woolf, architect.

Twickenham.—Wartime nurseries at Heathfield School, Powdermill Lane, and at 51, Hampton Road, Teddington; borough engineer, Municipal Offices.

Wakefield.—Rest centre, Flanshaw Hotel; city architect.
Alterations, Embassy Ballroom, George Street for Assembly Rooms, Ltd.; J. D. MacLeod.

Washington (Co. Durham).—Extension of British Restaurant; U.D.C. surveyor.

Whitwood (Yorks).—Canteen at collieries, Savile and Methley junction; Briggs Collieries, Ltd.

Wolverhampton.—Works additions and rebuilding factory; S. D. W. Timmins.
Factory additions; Sellman & Hill, Ltd.
Factory additions; Trussed Concrete Steel Co.

Workington.—Conversion of old brewery premises at Church Road, Harrington, into cinema; A. Coghlan, Carleton Road, Carlisle.

Worksop.—Sawmill; Godley & Goulding, timber merchants, Eastgate.

York. — Alterations at Assembly Rooms (£1,200); C. J. Minter, city engineer, Guildhall.